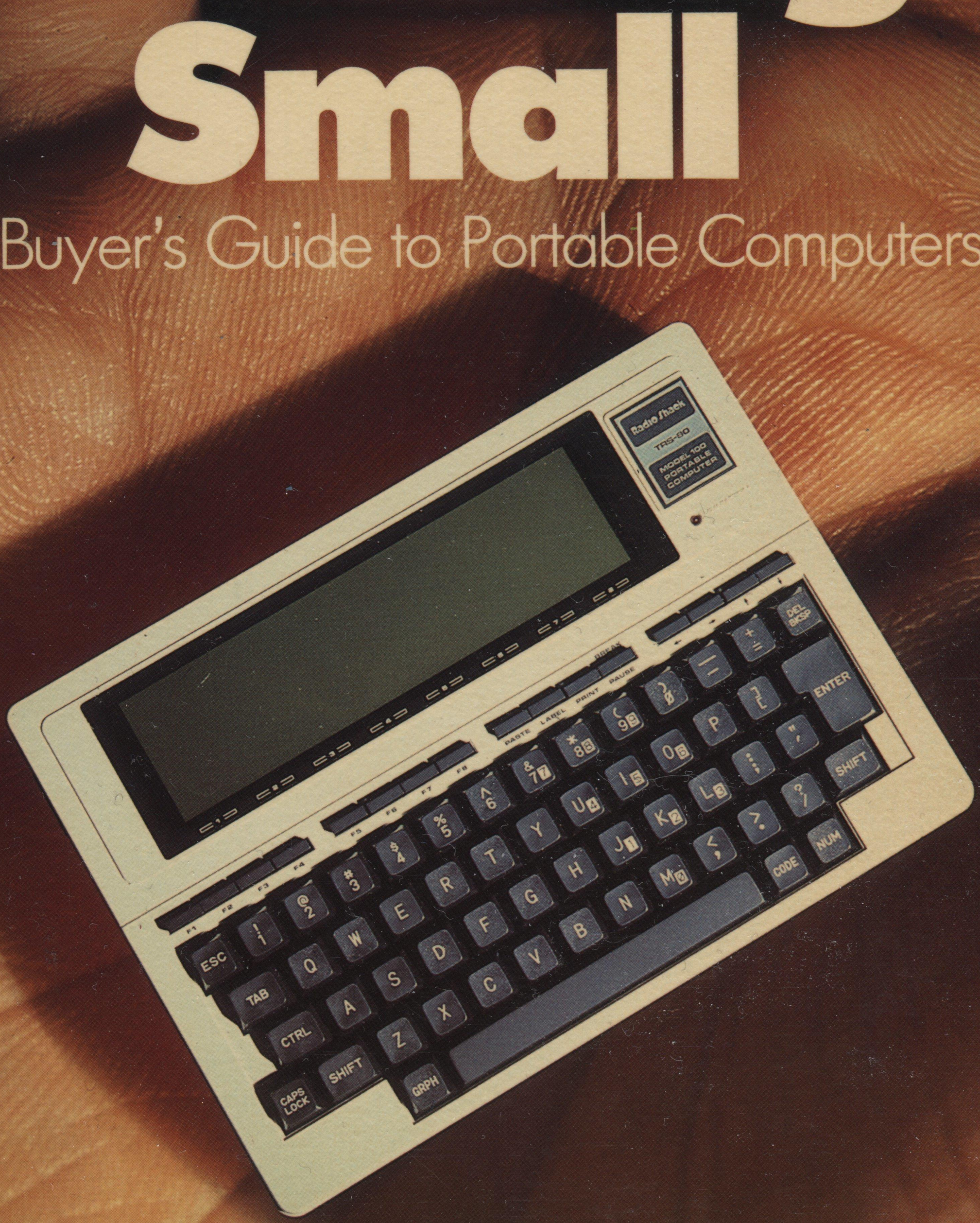
micro COMPUTER books

Charles Rubin & Michael McCarthy

Thinking Small

The Buyer's Guide to Portable Computers



Charles Rubin
Michael McCarthy

Thinking Small

The Buyer's Guide to Portable Computers

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This book is dedicated:

To Ron Lichty, who brought us together;

To Michael Larsen, who goaded us;

And most of all to our wives, who had to put up with it all.

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Chapter One

About This Book

So you're interested in portable computers, eh?

It's only fair to warn you that you've chosen the most explosive segment of the personal computer marketplace. But you've also chosen the most promising, for we believe that all computers are headed toward a future of compactness, value, and ease of use, characteristics that have come to typify portable computers. So there's no better time than now to begin thinking small.

In many ways, portable computers are the epitome of personal computer development. They have everything desktop computers have, and more: rapid technological advances, booming market growth, amazing variety, intense consumer interest, and value for your computing dollar.

The portable computer appeared when the desktop computer was six years old and the true explosion of consumer interest in personal computers was just beginning. The portable computer combined the most-desired features of desktop machines in a mobile unit, often for a price well below that of other computers.

It's little wonder, then, that only three years after they were introduced there are more than fifty portable computers on the market, weighing from three to over thirty pounds, selling for less than a thousand to nearly ten thousand dollars, and offering a vast and thoroughly confusing array of features and software.

Portable computers burst upon us and multiplied in size, price, and performance groups so quickly that keeping up with them feels like watching a football game where the players and the rules change every five minutes. In other words, you can't tell the players without a program.

That's what this book is: a program for the portable computer market. In it we'll look at the rules of portable computing: how portables differ from desktop computers, how they are changing, and what the changes mean to you as a user. We'll look at the players themselves: their performance, their strengths and weaknesses, and their reputations. Finally, we'll help you decide what you want in a portable computer, show you which machines offer the best features for what you want, and then suggest where to shop.

Why Portables?

But what's the big deal about portables anyway? Why have they taken off in such a short time and with such explosive growth that some analysts see them accounting for more than half of all microcomputer sales within a few years? Just why are portable computers so hot?

Like everything else related to portables, the reasons people buy them are changing. In the beginning, people didn't actually buy portables because they were portable. Sure, it was nice to know you could move an Osborne 1 around if you wanted to, but the computer's twenty-six-pound weight meant you wouldn't want to very often.

Two far more compelling reasons for the success of the Osborne 1 were price and the all-in-one design. At $1795 complete, including word processing and spreadsheet programs, the Osborne 1 (O1 henceforth) was less than half the price of a comparably equipped Apple II. That difference put real computing power within the reach of a much larger market, and it was that increase in market size that was the driving force behind the first portable explosion.

If low price made the purchase possible for more people than ever, the all-in-one design made it a far easier buying decision than that involving a desktop computer. When buying an Apple system, for example, you had to make separate purchases of the keyboard, the disk drives, the monitor, and the software. The O1, on the other hand, sold all of these things as a unit. Not only that, but the hardware was already



Photo 1-1. The Osborne 1 portable computer.

put together in a suitcase-sized package, so you didn't have to configure, wire, and plug in a bunch of separate boxes, as with desktop computers.

Finally, the O1 with its low-profile, plug-it-in-and-compute design seemed less intimidating to the computer novice. There was no "computer mystique" to the O1, and for many people turned off by the computer fraternity, that was a big plus.

What the Future Holds

The O1 was a daring concept in its day, but by now the Osborne marketing concepts of bundled system and low price have become the standard for much of the portable computer industry. But as portables become more common and technology makes them smaller and lighter, true portability becomes an important factor, and there are now smaller units that require little space and no external power source. These new truly portable computers make computing possible in surroundings and under conditions where it was never thought possible before. Reporters use lap-sized computers as elec-

tronic notebooks; engineers use hand-held computers to do field calculations; business professionals use briefcase-sized computers to prepare and print cost estimates while on the road.

As the technology continues to improve and completely portable computers begin offering display and storage abilities rivaling those of desktop computers, the number and variety of applications will also grow. The flexibility of computers suggests that once the constraints of size and functionality are overcome, the uses of computers will be limited only by our imagination and no longer by the hardware.

Someday, certainly within the next few years, portable computers as small as the notebook-sized computers of today will be every bit as functional as the most powerful of today's desktop computers. For now, though, there are significant differences between portables and desktops, and even among the kinds of portables. Our aim is to help you understand the differences.

How This Book is Organized

This book is in two parts. Part one, which includes the first five chapters, is a brief introduction to portable computers. If you're not entirely sure you'd know a computer if it stopped you on the street, part one will be a lifesaver. If you're an old hand with computers, you may wish to jump directly to the reviews in part two, which begins with Chapter Six.

Here's what you'll find in part one:

- Reasons why you might want a portable, and some reasons why you might not, in Chapter Two.
- Everything you really need to know about computer hardware to buy the right computer for your needs, in Chapter Three. We've left out all the jargon and all the material you don't need to know: this is a computer lesson for buyers, not programmers, so don't worry about getting in over your head.
- A discussion of the software, or computer programs, you use to make the computer work, in Chapter Four. This information helps you understand exactly what a portable computer can do for you.

- A four-step guide to buying a portable, in Chapter Five. After a Needs Analysis Questionnaire and Optimum Configuration Chart that narrow your search down to a manageable handful of portables, you'll find frank advice on where to buy and not to buy your first computer.

Part two is where you'll find detailed, brand-by-brand reviews of the portable computers on the market. Each portable is described in great detail and rated according to its suitability for different kinds of work. Our unvarnished opinion of each machine is included free of charge.

Here's what else you'll find in part two:

- A list of Also-rans (portables that haven't made it big and New Arrivals (announced but as yet unavailable), with all the information we could find, in Chapter Seven. Since it can take six to nine months between announcement and the first appearance of a computer in the stores, many of these systems may be hard to find well into 1985.
- Finally, in Chapter Eight you'll find a grab bag of advice on the care and feeding of your portable once you buy it and take it home.

You'll also find an appendix giving detailed reviews of WordStar, Perfect Writer, Perfect Filer, Perfect Speller, and Perfect Calc, the five programs most frequently included as free software with portables. We've put them in an appendix to save repeating the same words in a dozen computer reviews and so we could devote a little more space to detailing these best-selling programs. Another appendix suggests periodicals and books you'll find useful and interesting as a new computer user.

The Four Kinds of Portable Computers

We divide portable computers into four distinct size/function groups: **Transportables** (suitcase-sized, like the Osborne); **Briefcase** (small enough to fit into a standard briefcase); **Notebook** (roughly the size of an 8½-by-11-inch notebook

and light enough to be used in one's lap); and Pocket (hand-held computers that look like pocket calculators).

We've limited our evaluations to the first three categories: Transportable, Briefcase, and Notebook computers. These provide enough of the power of a desktop computer to permit word processing and spreadsheet creation, by far the two most popular uses of computers of all kinds.

Pocket computers don't have memories large enough to perform these functions acceptably. None has a display we consider adequate for spreadsheets (try doing a fifty-row spreadsheet on a one-line display and you'll see why we recommend the largest display possible for spreadsheets). And none has the standard-sized typewriter-like keyboard necessary to do word processing.

No doubt there are people out there torturing their computers and themselves into performing the most amazing functions. They scrunch their fingers together to type on the tiny keyboards, or expand their own memories in place of the computer memory so they can remember one end of the

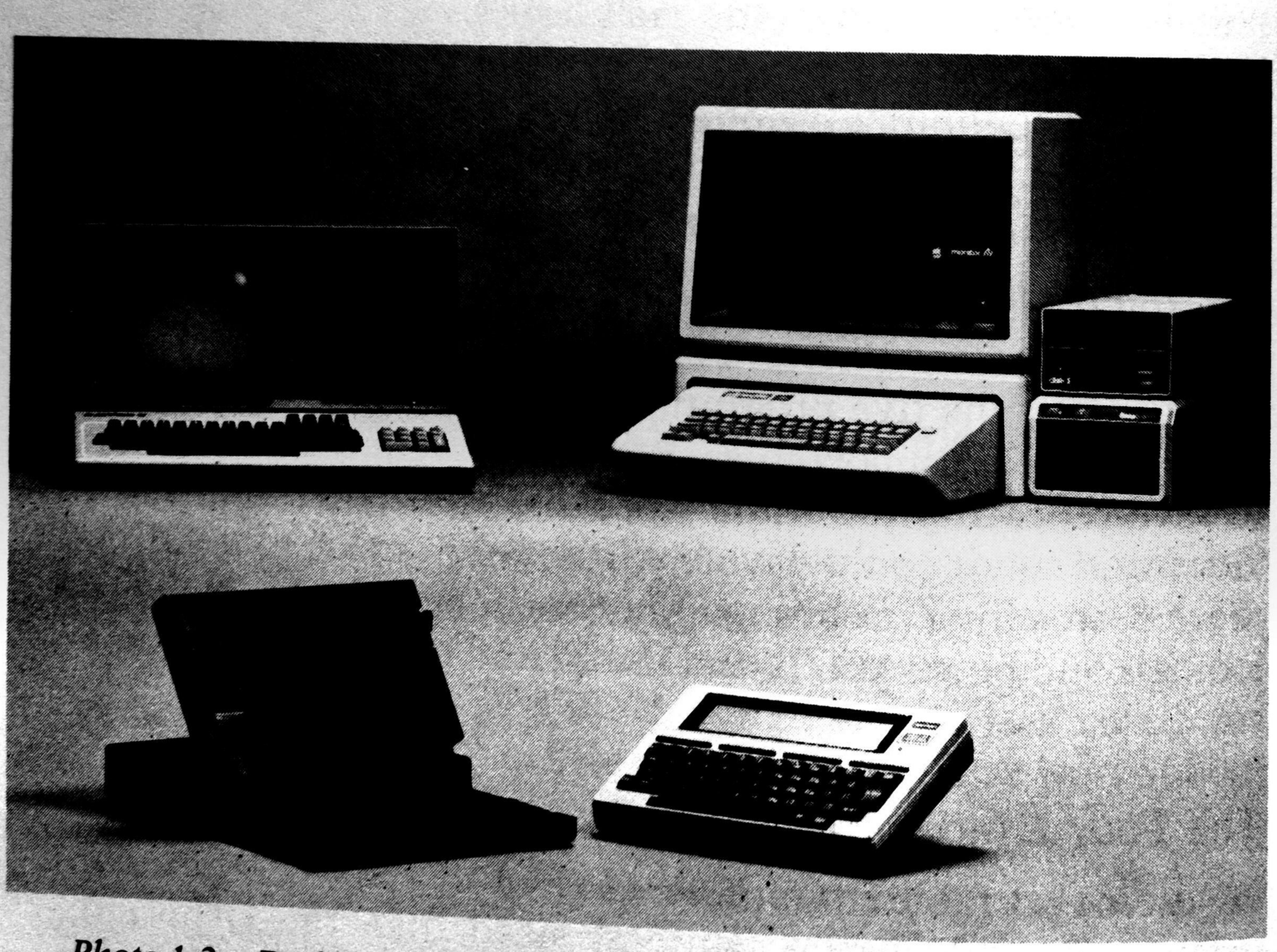


Photo 1-2. Desktop (upper right): Apple IIe with disk drives and monitor. Transportable (upper left): Kaypro II. Briefcase (lower left): GRiD. Notebook (lower right): Radio Shack Model 100.

spreadsheet after they've spent a minute and a half scrolling to the other end. But our feeling is that a computer should suit you, not vice versa.

That's something to keep in mind, both as you go through this book and, later, as you shop for a portable computer. The computer should do what you want it to do the way you want to do it. It should help you to improve your work and your productivity, perhaps even your quality of life.

On Shooting at Moving Targets

Because the portable computer market is growing so fast, we can guarantee that by the time you open this book there will be several new computers advertised that we don't mention here. We've tried to provide the most up-to-date information, but it's a losing battle with so many companies scrambling to get into the business. We've compensated for this problem by providing you with not only a collection of computer reviews, but also with the tools you'll need to evaluate the new computers as they come along. Then you'll be able to read the reviews and the advertisements and know what they're talking about, and what to look for.

Chapter Two

Do You Need a Portable Computer?

Five Reasons Why You Might Need a Portable

1. Because it's portable, for one thing! You can pack up a portable computer and move it in nothing flat, while moving a desktop computer can be a time-consuming and tedious experience.

If you can't afford two computers, yet you want a computer in your office and also at home or in your motor home or at your weekend cabin in Big Sur, a portable computer is the solution. Or perhaps your computer must be capable of being packed up and secured under lock and key—easy with a portable, not so easy with a desktop computer. Perhaps you need computer power in a place where there's no electric power, such as on a sales route or a camping trip—a portable is the answer. Or maybe you'd simply like the computer to be portable so you can use your desk for other things once in a while.

2. Portables give you more value for your money. Most portable computers, regardless of type, offer lots of computing power for your computing dollar—and usually free software too. The Osborne concept of bundled software has been almost universally imitated by other portable makers, and the saving on software alone can be $1500 or more. That makes

portables a good buy compared to desktop computers. A random example: A Chameleon portable with ready-to-run software costs about $2500 less than a comparably equipped IBM PC.

3. *Portables are easier to buy.* Packaged as a complete hardware unit with software included, portables save agonizing over a dozen buying decisions to get a system. Considering the computer and software as a unit is much easier than considering them separately, and the software is often more closely suited to the hardware and to the rest of the software than it would be if you pieced a system together.

Comparison shopping among portables is easier, too, because you compare complete package deals rather than multiple variations of mix-and-match components and software packages. This ease of buying and extra value is so great that it will offset your inability to think of any particular use for one or two of the free programs. In other words, don't think you're wasting your money just because you want WordStar but can't imagine any use for CBASIC. You're still ahead.

4. *Portables are easier to use.* Because of the bundled software and the one-piece construction, portables are far easier to set up and generally easier to use than desktop computers. The hardware is complete, so you need never see a circuit board. Software supplied with the portables is often fully documented for that specific computer, while desktop software is generic and must be configured to the specific model you purchase (by you, you lucky devil).

5. *Portables are smaller.* They take up less space on your desk than desktop computers. You can actually put a portable computer on your desk and still have room for your telephone and a stapler. Not so with most desktop models. And since it's very easy to scoop your portable up and stow it in the corner (or even in a desk drawer), you don't need special (expensive) computer furniture.

The Other Side of the Story

With all these advantages, you'd think that everyone in the world would be rushing to buy a portable (which many are), and that the market for desktop models

would be withering on the vine (which it isn't). Portables are enjoying wide popularity, but honesty obliges us to admit that portables have their disadvantages as well. Consider:

1. Most portables aren't expandable. With a few notable exceptions (clearly indicated in our reviews), portable computers are sealed units that do what the brochures say they'll do and aren't expandable beyond that. While you can add a hard disk, a modem, any kind of printer, and many external peripherals, there are limits in key areas. If you want more storage, you can't just stick a bigger disk drive inside a portable. If you want to change processors, that's too bad. If you want to add RAM, it's tough to do for most portables. So if you think you'll be needing to upgrade your computing capability in the future, bear in mind that if you buy a nonexpandable portable today, you'd better be willing to buy another computer when the time comes.

2. Portables have small screens. While desktop computers commonly have 12-inch or 14-inch monitors, the biggest screen available on a portable computer these days is 9 inches, and some portable screens are as small as 5 inches. When displaying 80 columns by 24 lines, that makes the letters and numbers awfully small. High-resolution monitors mitigate this problem somewhat, but don't ever let anyone tell you that a portable computer is as easy on the eyes as a desktop computer with a larger display.

The application you plan to use most will be a determining factor in judging the seriousness of this drawback. If you plan to do a lot of text processing or spreadsheeting, where the screen is usually filled with characters, think about how many hours a day you'll spend at this activity. There's an old joke that you can spot early Osborne users because they're squint-eyed and stoop-shouldered. If you'll be using the computer mostly in one place, find out if you can use an external 12-inch monitor with it. Consider the quality of your eyesight and take a close look at the actual computer screen you'll be living with, so you can judge for yourself.

3. Some portables have small keyboards. Many portable keyboards simply don't compare in size or functionality with the best detachable desktop keyboards. Notebook and briefcase computers, especially, tend to have smaller or fewer keys than you'd like (leaving out numeric keypads is a fa-

vorite space-saving technique). Most portables lack a palm rest area around the keyboard, a feature important for comfort in long-term use.

Newer portables, such as the Compaq, Columbia VP, TeleVideo, and Chameleon, provide just about all the keyboard you can get anywhere. If the portable keyboard you're considering is limited, the application you have in mind may determine whether it's worth the sacrifice in exchange for the benefits of greater portability.

4. Portables are small and mobile. Yes, we said this was a virtue, but it can also be a drawback in areas where security may be a problem. An Epson HX-20 advertisement showed two college students, one lugging an Apple, the other a Epson: the ad indicated that a portable is much easier to carry conveniently. On the other hand, it is also very easy to steal conveniently. Portables are so attractive that a crook who doesn't know the difference between a RAM and a ratchet wrench will steal one just because it looks expensive. So bear in mind your working environment, and consider special security precautions.

5. Portables are cute. This may sound silly, but an amazing number of people become enamored of an electronic device simply because it's smaller and cuter than the popular version. Remember the Sony television sets with the five-inch screens? And how about the wristwatch televisions with the one-inch screens?

If you're susceptible to the charms of miniaturization, make sure you don't succumb to a midget computer that doesn't serve your needs as well as a larger version. Think hard about why you need a computer that fits in your briefcase or under your arm.

The best way to consider the pros and cons of owning a portable is to have some idea of what portables do—and how they do it.

Chapter Three

Computer Basics

If you know a lot about microcomputers, you'll be able to follow the detailed computer reviews in the second half of this book quite easily. If you're new to it all, read this chapter first. You'll find all you need to know about portable computers. The main components are explained briefly, but we don't dwell on them. Instead, we talk about selling points and buying decisions, and trade-offs like price and performance.

We simplify the explanation of hardware (even oversimplify it) because this is a buyer's guide, not a college text. Besides, you can't learn everything there is to know about portable micros before buying one. So we stick to the points you need to know to buy a portable that will do what you want it to do—at a fair price. (Chapter Five has a checklist to help you organize your computer needs.)

The Five-minute Computer Intro Course

Before we go into the details of the computer components, we'll give an overview of how a computer works.

A computer is just a tool: a ball-peen hammer with buttons, a typewriter with some extra bells and whistles, a sheet

of graph paper displayed on a television tube. There's no more reason to fear a personal computer than there is to fear a hacksaw. Less, in fact, since you can't really injure yourself with a portable computer unless you drop it on your foot.

But how does it work? This is a great mystery to many people. If you could sit in front of a computer for ten minutes, a knowledgeable friend or salesperson could convey the basic idea to you quite easily. In fact, anybody more than a month ahead of you in computer experience can give you an introductory lesson that will clear up a lot of mysteries.

Let's see what we can do in prose to take the place of that ten-minute hands-on lesson.

The typical portable computer comes in two pieces: the main box, which holds the disk drives, the screen, and some plugs and buttons; and the detachable keyboard, which usually snaps over the front of the computer for transportation.

Inside the main box is the computer itself: a green plastic board with dozens of integrated circuits (ICs, or chips) and other electronic parts on it. On some portables, you can't even open the box. As with your television set, you could go

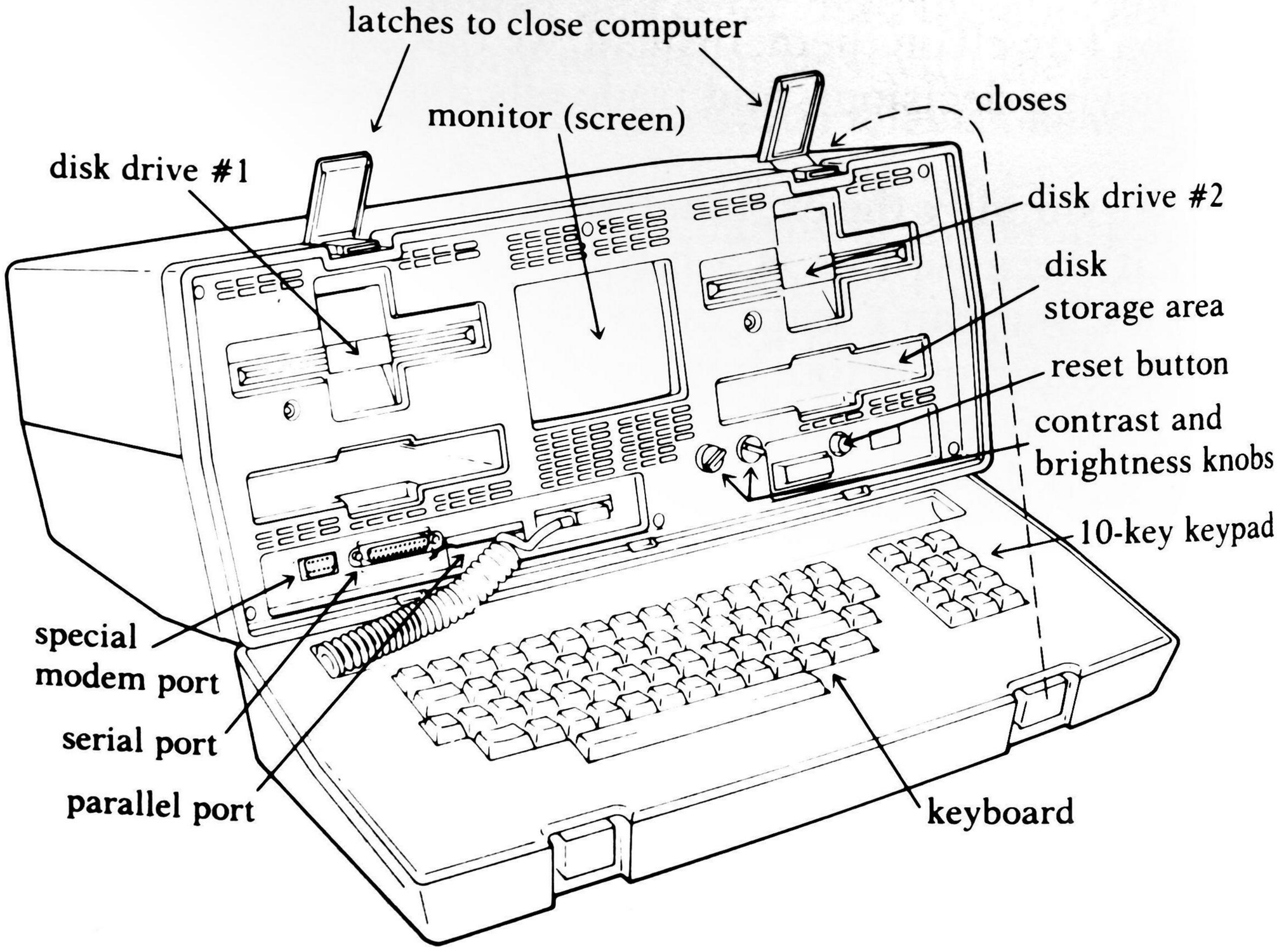


Figure 3-1. A typical portable computer.

for years without ever seeing the inside of your computer; let the technicians worry about it. The parts you do worry about are the keyboard, the screen (monitor), the plugs and buttons, and the disk drives.

The **MONITOR,** which looks like a television screen, displays words and pictures that let you know what is going on. When you run a program, the screen will often show a list of choices, called a **MENU.** At other times, it displays what you're typing at the keyboard. Or it will show messages telling you what the computer is doing with your data. (Some portables use a flat display instead of a tube, to save space and weight. The principle is the same.)

The **KEYBOARD** is for typing things you want the computer to do something with. For example, you might pick a choice from the menu displayed on the screen by entering a number or letter at the keyboard. Or when writing a letter or entering your inventory or accounts receivable, you type the letter or put the information into the computer through the keyboard, then tell the computer (via keyboard) what to do with the information.

The **DISK DRIVES** (usually two) hold both the **PROGRAMS** and the **DATA.** Programs are computer instructions, also called **SOFTWARE,** that tell the computer how to do what you want it to do—play Space Invaders, or fix the spelling in your Great American Novel. You don't usually worry about how programs are written, you just load them and follow the instructions.

Programs are recorded on disks, the way music is recorded on a cassette tape. To load a program, put a program disk into one of the drives, close the drive door, and type something at the keyboard to let the computer know what to load. The computer then reads the program from the disk and stores it in the computer's memory, called **RAM** (random-access memory). The more memory (RAM), the bigger the program the computer can hold and use. Once the program is in the computer's memory, the computer follows the instructions, displays the menu, or obeys your commands from the keyboard.

The data you generate—say, the letter you're writing to your Aunt Tillie—has to be stored somewhere too. You may wish to print it by typing a few instructions on the keyboard which tell the computer to print a copy (you must have a

printer attached to the system). Or if you wish to store it for later editing, use a disk for this, too (usually a separate disk that you put in the other disk drive). This becomes your data disk, holding your data.

When you're done with that job, take the program disk and the data disk out, put in another program disk and data disk, and you can do some other job. You can switch from word processing to games, to accounting, or to spreadsheets just by switching disks. A computer is an all-purpose machine.

On the smaller portables, there may be substitutes for the disk drives (again, to save space and weight): bubble memory, microcassette tapes, or low-power CMOS memory. We'll talk about these in detail later.

Finally, the computer has various ports, or **INTERFACES**, which are connectors you use to plug in various external devices, called **PERIPHERALS.** The most popular peripheral is the **PRINTER.** There is also a device called a **MODEM**, which lets the computer talk on the telephone with another computer (which is referred to as telecommunications).

Congratulations! If you've read the preceding paragraphs, you are now computer literate. Wasn't that easy? All you need now is a little practice at an actual computer, and you'll be a computer whiz in no time!

Yes, you may be told that you must learn programming to use a computer, but don't believe it. A short course in BASIC or Pascal wouldn't hurt, but lots of people use personal computers for years without learning any programming at all. Concentrate instead on learning as much as possible about the specific programs you use day-to-day. Become a WordStar star, a VisiCalc whiz, an expert in Personal Pearl, and leave the tedious, demanding world of programming to those with a taste for such things.

But what about all that talk of 8088 coprocessors, bank-switched RAMs, I triple E parallel ports, and expandable S100 card cages? What, in other words, about that bane of the computer business, *jargon*?

Jargon does have its uses; it acts as a shortcut for knowledgeable people. But it can cause you to buy more than you need or to throw away a good buy. Worse, it can confuse the heck out of you and even discourage you from getting a com-

puter at all. In the rest of this chapter, we'll mention the jargon you need to know to make an intelligent buying decision. And we'll ignore all jargon that a beginning computer user can (and as a beginner probably should) ignore. Call it buyer self-defense. If we skip over some bit of jargon or a gadget you've been told is important, assume the item in question isn't crucial to deciding what computer to buy.

(If you have some unusual requirement for special equipment, that should become clear from the needs checklist in Chapter Five. You'll then know you need more information in specific areas.)

Types of Portables

For this book, we recognize four general kinds of portable computers: transportables, briefcase, notebook, and hand-held. All but the hand-helds are full-featured computers with sufficient internal memory and adequate keyboards to perform most business tasks to some extent.

Because hand-held computers are limited in their operation, and have inadequate keyboards, we consider them elaborate calculation devices rather than true full-featured portable computers. Therefore we do not review hand-held computers.

Transportables

The earliest model portables weigh over twenty-five pounds and are portable only in the sense that they have handles and can be lugged short distances in one hand. Moving an Osborne or Kaypro (26 pounds) or Star-Lite (33 pounds) is not undertaken lightly (pun intended).

Of course, compared to forty-pound desktop computers with their maze of wires and connectors, even a Star-Lite is highly portable. It takes about ten seconds and a flip of a lid to prepare it for transportation, and it does have a handle. Try moving an Apple.

Most people buy transportables (as we call these heavier portables) because they are cheaper than equivalent desktop computers of the same power and capability. They are easy to use because they are integrated as one package. Trans-

portability makes it handy to move them off the desk when necessary and to take them home from the office at night occasionally.

Transportables are for the most part indistinguishable from desktop computers in power and capability. For most users, the main thing being sacrificed is the smaller size of the monitor.

Briefcase Computers

This is the name we've given to certain portables which have attempted to shed some weight so they can be carried along on business trips or taken home every night without removing one's arm from its socket. They generally weigh ten to twenty pounds and sacrifice some functionality to gain that weight advantage. Most will fit into a briefcase (if you put nothing else in the briefcase).

Briefcase computers like the Gavilan use non-CRT displays to save space and weight. The GRiD uses a special flat panel display, for example. Some will have disk drives built in or added on. Special attachable printer modules are sometimes available. When all the options are put together, the whole shebang will still fit (tightly) into a briefcase (or specially built carrying case). There may be some limitation on memory size.

Notebook Computers

These are the latest rage. Weighing about five pounds, they are truly portable and can actually be used on your lap or on any convenient surface.

Notebook computers sacrifice full functionality for greatly increased portability. Most have full-sized keyboards, but reduced displays (from 2 lines of 80 characters to 8 lines of 40 characters—it's changing rapidly). Instead of disk drives, they use special chips to remember what you write, and save it for weeks on the strength of small internal batteries. In addition, they often have built-in modems so information can be sent by phone to larger computers.

There is some sacrifice of functionality in notebook-sized computers that makes them suitable mainly as second computers, or as computers for reporters or sales personnel who will send their data by phone back to the office.

Notebook computers, in many ways, are like ordinary notebooks—good for doodling and taking notes. But you really need another computer as backup for the heavy work (the other computer can be a transportable).

The ideal of the portable computer is the Dynabook, dreamed up by Alan Kay at the Xerox advanced research lab in Palo Alto ten years ago. He envisioned a notebook-sized computer simple enough for a child to operate, yet more powerful than the most powerful desktop computer of today. While the dream is not yet fulfilled, portable computers bring it closer than ever before, providing unprecedented power and flexibility at very modest prices.

The Basics

We've divided the computer system into nine main components:

- the **COMPUTER** itself, which consists of the "chip" (microprocessor) and the operating system that makes it run;
- **RAM**, or active computer memory, in which programs and data are stored while being used;
- the **KEYBOARD**, used to put information into the computer;
- the **DISPLAY**, which shows you what the computer is doing;
- **STORAGE**, where programs or data are stored when not being used: disk drives, cassettes, cartridges, or bubble memory;
- **INTERFACES**, which connect the computer to external components such as printers;
- **PRINTERS**;
- **MODEMS**, by which your computer makes phone calls to other computers;
- and **SOFTWARE**, computer programs you need to write letters, perform calculations, or file data.

For each component, we'll point out where portables differ from desktop computers.

THE COMPUTER CHIP

The actual computer of the microcomputer resides in the **CHIP**—something that looks like a miniature map of Manhattan. If you open up a computer, you'll see a green plastic board crammed with black plastic oblongs. Each black oblong holds a computer chip, where the computer's thinking takes place. Some of these chips run the disk drives, others handle the memory and power supply. One of them—hard to distinguish from the others at a glance—is the main chip, called the **CPU**, or central processing unit.

The CPU is absolutely essential to the computer, but you'll be glad to know it's not absolutely essential that you know much about it. As with a car engine, the important question is will it take you where you want to go as fast as you want to go? Camshafts and gear ratios are of interest mainly to hackers.

So don't panic when you hear terms like Zilog Z80, Intel 8086 and 8088, and Motorola 68000. These are just CPU chip brand names. What you really need to know is what kinds of software the computer can accept.

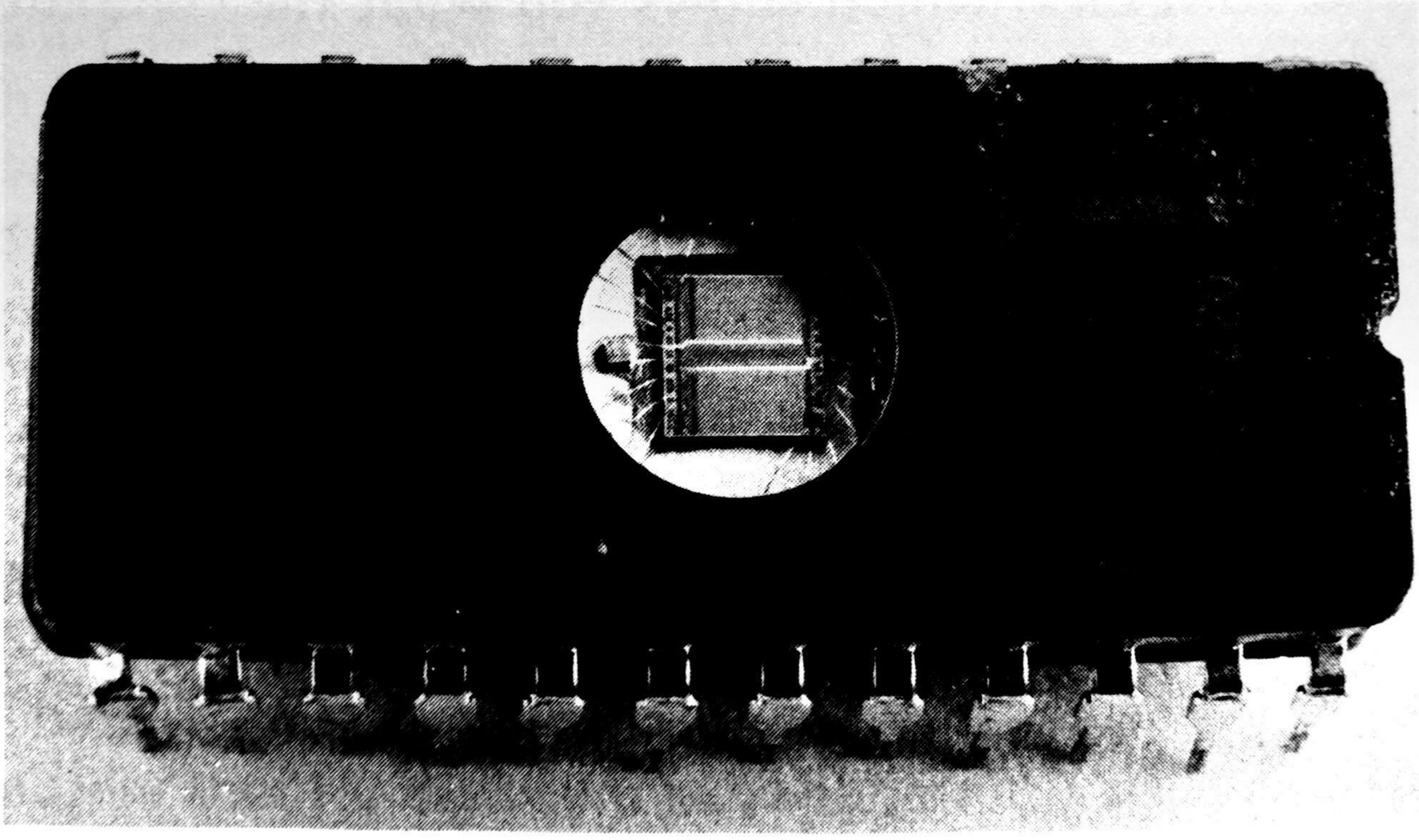


Photo 3-1. A computer chip in its black carrying case—the "brains" of the computer.

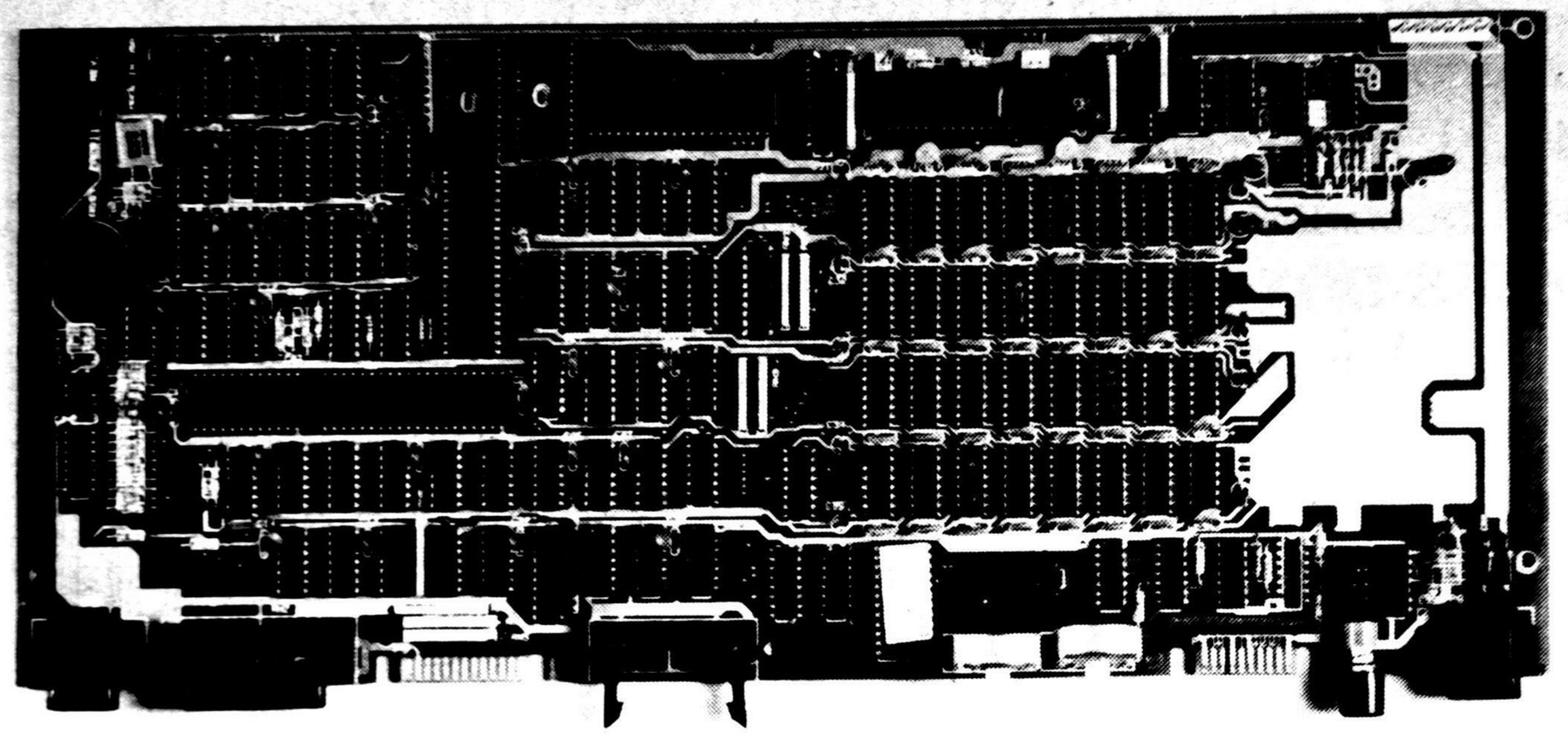


Photo 3-2. The computer board. Every black rectangle holds a chip: RAM, CPU, ROM, etc.

Operating Systems

What kinds of software the computer can run depends on the computer's operating system. The operating system (or **DOS**, for disk operating system) is a short program that coordinates the activities of other hardware components such as disk drives and active memory. Since operating systems are designed for specific computer chips, the exact chip your computer uses determines its choice of operating systems. This is important because each computer program is written to run on a specific operating system. It can't run on another operating system unless it is rewritten, which can be difficult or impossible.

Happily, there are two operating systems that so dominate the world of micros that you can learn about them and know most of what you need to know about operating systems. These two biggies are CP/M and MS-DOS.

CP/M The "classic" operating system for business users, CP/M runs mainly on the Z80 chip. With a Z80 chip computer you have access to some of the thousands (20,000? nobody knows for sure) of programs written for CP/M, which stands for Control Program for Microcomputers. Both CP/M and the Z80 have been around for a long time, so they are proven winners with an enviable track record. Because they're inexpensive, you can get a lot of power for quite reasonable prices.

MS-DOS MS-DOS (Microsoft DOS) is the operating system found on the 8088 chip. (It also runs on the similar 8086 chip.) IBM is this operating system's ticket to fame and fortune, because the IBM Personal Computer (PC) uses the 8088 and MS-DOS, which is called PC-DOS on the IBM.

IBM is selling PCs so fast that software designers are capitalizing on the success by making software for MS-DOS. While the number of choices is still a bit limited, by the end of 1984 there should be enough MS-DOS software around to satisfy almost anyone.

When a computer is advertised as "IBM-compatible" that means the computer runs the MS-DOS operating system and can read the IBM disk format. However, there are several levels of "compatibility," so be aware. Exactly how compatible an "IBM-compatible" computer is depends on technical considerations such as whether it uses the 8088 or 8086 processor, whether it has a coprocessor, and other things we won't go into here. If you are excited about IBM compatibility, look for a list of exactly which IBM programs the computer you're considering will run. Even better, look for a list of IBM programs the computer *won't* run.

The Major Proprietary Systems While MS-DOS and CP/M are licensed for use by a number of manufacturers, there are two proprietary operating systems used by companies whose computers have become so popular that they are well worth considering here. The two companies are Apple Computer and Radio Shack, whose DOS 3.3 and TRS-DOS, respectively, each run thousands of programs. There is a lot of software available to run on these operating systems because Apple and Radio Shack computers sell extremely well, and it is worth the time of independent software developers to make programs that run under their operating systems. Apple recently began marketing portable computers, and there are two portables that are said to be Apple-compatible (see reviews), and Radio Shack has a portable version of their Model 4, called the 4P (see review, and note that the Radio Shack TRS-80 Model 100 does not share the TRS-DOS operating system).

And The Others A few portables use other operating systems—UNIX, Xenix, CP/M-86—as well as other proprietary operating systems invented by the manufacturer. These operating systems are newer, so there are fewer programs avail-

able for them. It's not worthwhile for the average beginner to worry about these other operating systems. This is especially true for proprietary operating systems, which drastically limit your software selections, in some cases to fewer than a dozen programs. More programs are always promised, but we strongly urge you to buy based on what exists, not on what is promised.

There are exceptions. Special-purpose computers, intended for limited, focused applications or as second computers, may have uses important enough to you that the limitations of proprietary operating systems are acceptable. Just make sure you are aware of the highly focused purposes of these computers.

Also, you may have a special, unusual requirement for a computer program. The rule here is first to find the program that will do the job, then to choose from among the computers that will run that program. If this means using a lesser known or proprietary operating system, then do it. Just make sure you need something unusual and aren't flattering yourself that your business is unique. Chapter Four talks about business software applications in more detail.

Since you'll see CP/M and MS-DOS so much, let's review their main differences. CP/M-Z80 can produce only limited graphics in black and white, while MS-DOS/8088 has good graphics and can run color (at extra cost). This is important because there seems to be an insatiable demand for four-color pie charts (heaven knows why).

8-Bit Versus 16-Bit

There is great controversy in the micro business at the moment. Just yell "8-bit is dead!" at a computer fair if you want to start a fight. CP/M is the great 8-bit operating system. MS-DOS is the monarch of the 16-bit world. So what's the difference? An **8-BIT** computer like the Kaypro II processes eight bits of computer data at one time. A **16-BIT** computer like the Compaq handles sixteen bits at a time.

The 16-bit computer ought to be faster than the 8-bit, but the number of bits processed at once is not the only factor at work in computer speed. Most business applications on micros are "**I/O** bound," meaning the computer chip spends so much time waiting for input (from your slow typing) and

waiting for output (to the slow disk drives or printer) that actual processing time is minimal. (Compared to the speed at which the CPU operates, the whole world is slow).

If you're a programmer compiling long programs, or a math-heavy engineer doing graphic modeling, then processor speed will be valuable. But in that case you should probably consider getting something *really* fast, like the 16-bit Intel 8086 or Zilog Z8000, or the 32-bit Motorola 68000.

On the other hand, if you're the average business person using the computer for accounting, word processing, or spreadsheets, you'll get more speed and performance out of your computer by adding a hard disk drive or a printer buffer than by worrying whether your computer chip is an 8-bit or 16-bit model.

Where the 16-bit computer really shines is not in speed, but in memory. The 8088 can make effective use of over one million characters of memory at one time. That's a lot! With fancy footwork, an 8-bit Z80 can juggle up to 512,000 characters, though not gracefully. But the average Z80 computer is limited to 64,000, or sometimes 128,000, characters of memory. In the section on RAM we'll talk about why this memory capacity makes 16-bit computers the wave of the future.

Which Is Better? Until recently, all the famous names in micros, like Apple and Radio Shack, made nothing but 8-bit computers. If you wanted any kind of real choice in software, it was 8-bit all the way.

Now the excitement is all in the 16-bit world. Everybody is developing 8088 computers, or at least add-on devices that convert their existing 8-bit computers into 16-bit computers, so they can run MS-DOS.

New software is being written directly for the IBM, and both CP/M and Apple software are being translated over to run on MS-DOS too. (It's odd that this is even possible, considering that DOS 3.3 and CP/M are completely incompatible with one another.) This means the two biggest software treasure chests in the computer industry (DOS 3.3 and CP/M) are converging on MS-DOS.

Don't write off CP/M quite yet, though. You can get very good deals on powerful 8-bit portables; price is still an important issue for most people. And the future notwithstanding, there is still much more CP/M than MS-DOS software

around at the moment, and there will be for some months to come. Even when MS-DOS wins the software head count, there will still be those tens of thousands of CP/M programs lying around.

Conclusion

The bottom line on computer chips is money and software availability. The number of people using CP/M for 8-bit Z80 computers is sizeable. These computers will be around for a long time, even if they are technically overshadowed by the 16-bit computers. Their primary benefit at this time is their relatively low cost, and access to a gigantic and existing (rather than anticipated) software base. Their actual day-to-day computing power is more than adequate for the majority of personal computer users.

If you can afford to pay the premium to buy for the future, we advise an IBM-compatible portable. The more compatible it is, the better, since IBM will (from all evidence) dominate this market for the foreseeable future. If you have special needs in software, however, you'd better make sure it's available in MS-DOS now. Don't take promises.

Because of extremely limited software choices, proprietary operating systems can be recommended only for special circumstances. For example, the extreme portability, ease of use, and affordability of the Radio Shack Model 100 makes it desirable as a second computer, even though its operating system is unique. Besides, you can send text and data files from the Model 100 by modem to any other computer, regardless of operating system. As a focused-purpose machine, and especially as a second computer, the Model 100 makes the sacrifice of an existing software base tolerable.

As a beginner, look for "CP/M" in 8-bit computers and "IBM-compatible" in the others. If neither is present, re-examine your Needs Analysis chart carefully before deciding to buy.

RAM

RAM (Random Access Memory) is the computer's main active memory. It holds the operating system, the program

being used, the data that is generated, and serves as a scratch pad for the computer. (Notebook computers like to put a lot of this into **ROM**, or Read-Only Memory.)

RAM is a temporary holding area for whatever is going on in the computer. When you first turn the computer on, RAM memory is empty. Load a program, type a letter, access your data base, and the information is put in RAM memory for the computer to use.

When you turn off the computer, the RAM is erased. RAM is just *temporary*, transient, memory, good only as long as the computer is on. For that reason, you need long-term storage devices such as disks to hold the information when the computer is off. Follow the instructions of the program you're using to store the RAM information to disk.

The Buying Decision

The buying decision to be made concerning RAM is: how much? The more RAM your computer has, the bigger the program you can run and the more data you can use at a time. Generally speaking, more RAM is better.

RAM size is measured in **K**, which means 1000 units of memory, so that "64K" means 64,000 units of memory. One unit consists of one character, such as a letter of the alphabet or a number. What that translates into in pages of typed copy varies with the program: on the average, 2K equals one single-spaced page.

In the old days, micros used to start out with 4K RAM and you could add more, to 16K, 32K, and 48K. If you were rich, eventually you could add as much as 64K of memory. Today, most of the portables we study here come with a minimum of 64K. Memory has become cheap—so cheap that the limiting factor is now how well the computer chip can make use of all that available memory.

RAM for 8-bit Computers

The average 8-bit (CP/M) microcomputer has 64K of RAM, which is the maximum RAM size an 8-bit computer can use at one time. A few have 128K or more, accessed with a programming trick called bank switching, whereby "banks," or blocks, of memory are switched in and out of the system as needed.

There are also programming tricks that let you use a program larger than RAM by swapping parts of the program in from the disk when needed (WordStar, which is 80K in size, does this), but there's a limit to how far this can go.

Because electronic spreadsheet programs such as SuperCalc are kept entirely in memory, larger RAM is desirable to those who use giant spreadsheets. And the speed of sorting a long list (like your name and address data base) depends on RAM size. Sorting in limited RAM can be done by swapping portions of the file on and off disk; it's just slower.

RAM for 16-bit Computers

Most 16-bit computers start out at 128K and are expandable to 256K and 512K. The problem with larger RAM sizes is that the program must be written to take advantage of it; it's not automatic. To date, few programs are available that make full use of these larger memories.

Nevertheless, bigger memories are the wave of the future. The reason is that if computer program "friendliness" is ever going to become more than just advertising cant, it's going to take RAM—lots and lots of RAM. Menus, elaborate error messages, and programming designed to handle your mistakes and make minimal demands on your training, all take up programming space. The popular Lotus 1-2-3 program, for example, is easy to use and combines a spreadsheet, a simple data base manager, and a graphics program all in memory at the same time. The *minimum* RAM it requires is 256K!

With this kind of memory, 16-bit computers can handle split screens, multiple programs operating at the same time, and multiple users. In other words, 16-bit computers have power and potential, not just speed.

When you buy a 16-bit computer, you're betting that programmers will take advantage of this extra RAM and write interesting new kinds of programs. It's not such a bad bet. Already some of the most interesting programs on the market—Lotus 1-2-3, VisiOn, MBA, Memory/Shift—are available only in 16-bit and only with 128K or 256K minimum RAM.

The Buyer's Guide section lists the computers and their

RAM, and also indicates if this RAM is expandable, and to what maximum size.

ROM

There is another kind of computer memory, called **ROM** (Read-Only Memory). This is, unlike RAM, permanent and does not disappear when the machine is turned off. Programs or instructions engraved on a ROM chip can be read by the computer but cannot be changed.

Suitcase portables, like desktops, generally have minimal ROM, just enough to start the computer when it's turned on. Manufacturers prefer to put their programs for these models on disk.

Notebook-sized computers save space and weight by including basic programs in ROM chips. In these computers, the size of ROM is an important buying consideration. ROM can substitute for limited RAM. The Radio Shack Model 100, with only 32K RAM, has BASIC, a text editor, a scheduler, an address list, and communications software all built into ROM, and when in use none of these take up RAM space. The result is that the Model 100 has, in most applications, as much net RAM available for use as most desktop computers with 64K.

DISPLAY

The display is usually a television-like video tube, also called a monitor or **CRT** (cathode ray tube), that displays what you type on the keyboard, the computer's responses to this, and the results of the computer's work. Larger portables use video monitors for display; smaller portables, to avoid the weight, space, and power consumption of the monitors, try other tricks such as **LCD** (liquid crystal display) displays that resemble the displays on hand-held calculators. We'll deal with each type of display separately.

The Portable Difference

Transportables Transportables, like desktop computers, use a video monitor similar to a television set. The burning issue in monochrome (one-color) monitors is which color to use:

white letters on a black background (now obsolete); green on black (most common); or orange on black (the latest rage). Black letters on white background (like typed paper) is too expensive and power-hungry a display for portables.

What color to buy? After long and careful study, the experts have revealed the following: most people like green more than black and white, and most people like orange more than green. That's it. There is little evidence that it makes a heck of a lot of difference what colors are used. Therefore, Our Recommendation: buy what appeals to you.

Don't use a full color monitor. They're fine for games and graphics, but when it comes to displaying words and numbers for spreadsheets, word processing, and data processing, color displays are bad for the eyes, because clarity and focus are much lower than on standard monochrome monitors. If you need a color monitor, be sure to buy a good monochrome monitor too.

Another issue is display size: how many characters per line, and how many lines on the screen. Since you can always move around your document and look at any portion easily, no matter what size the screen, display size is more a psychological element than anything else. Still, the rule of thumb is: the more, the better.

All the transportable computers reviewed here display 24 lines of text, which is just under half a page (full-page displays are incredibly expensive and make awesome demands on the power supply). Most of the portables also display eighty characters on a line (which is called "80-column"). And people consider anything short of 80-column unacceptable, even though most people actually use a 65-character line. Display width really matters most to those using very large spreadsheets (e.g., SuperCalc and VisiCalc).

Rule of thumb: 80 is better, 65 is acceptable, 52 is okay if you can get a great deal on the price.

Another issue is the actual size of the monitor. Most desktop computers have 12-inch monitors, but all portable displays are smaller because the monitors and their power supplies are the heaviest things in the computer.

The Osborne 1 and the Otrona Attache are 5 inches diagonally, and both are considered too small by industry pundits. The Osborne Executive, The Hyperion, and the Jonos Escort have 7-inch monitors of 80-column display. All the

other transportables have 9-inch monitors, the standard for this size of portable. Many of the transportables have plugs that let you connect a 12-inch monitor to your portable (the larger monitor can be left behind when you travel).

Briefcase and Notebook These computers use nontube displays, usually dot-matrix LCD, which is similar to a pocket calculator display except with larger characters, even larger than the characters on the video monitors. The main issue with LCDs is number of lines and characters displayed. There seem to be three common sizes at the moment: 4 lines of 20 characters (Epson); 8 lines of 40 characters (Radio Shack Model 100); and 8 lines of 80 characters (Sharp, Gavilan). Most of the hot new entries in the notebook computer world are opting for the larger formats, and it sure is nice to have that extra viewing room.

Rule of thumb: settle for less only if the computer you are considering offers something special you can't get on the 8-by-40 models. And expect 25-by-80 character displays before 1984 is out.

KEYBOARD

The keyboard is the component that is least noticed when bought, and most noticed when used. For many people the keyboard can be the single most joyful—or most frustrating—part of the whole computing experience, mainly be-

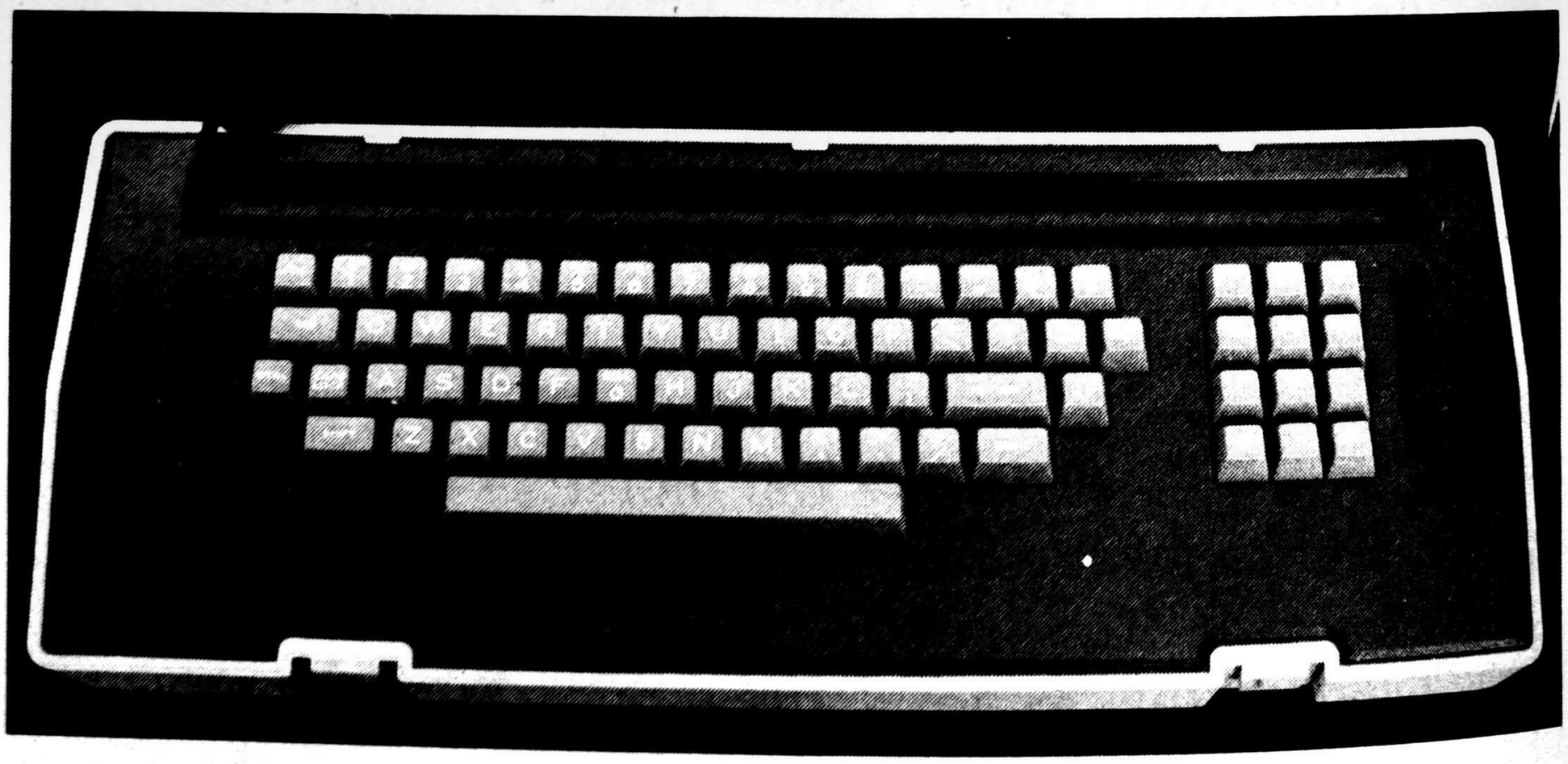


Photo 3-3. **A typical computer keyboard (Osborne 1).**

cause it is the thing you bang on all day long. Little annoyances become big annoyances toward the end of a 40,000-keystroke day.

But keyboards are so much a matter of personal taste that we can't recommend specific keyboards outright. We can only recommend that you *do* pay attention to the feel of the keyboard, and spend some time pounding on it, to see how you like it. You're the one who has to live with it.

All the computers considered in this book have keyboards with full-stroke, typewriter-like keys. We find six main areas to consider in keyboards:

- location of cursor (arrow) keys;
- key "break" or keyclick (and whether you can turn it off);
- dedicated or programmable ("soft") function keys;
- similarity to standard keyboard;
- keypad, if you do a lot of numbers;
- feel.

Cursor Keys

That little movable line or block on the computer screen tells you where you are at any given moment. It marks the location of the "typing element." You use the cursor keys, called



Photo 3-4. The IBM PC keyboard.

"arrow keys" because they have arrows on them, to move the cursor around the screen so you can put things where you need them.

Most computers have special arrow keys. Some portables have arrow keys doubled up on some of the alphabetic keys. On the IBM-like portables, the arrows are on the keypad, and to activate and deactivate them you hit a (poorly-designed) toggle.

There are two things to watch for. First, if you have to hold down a special key or hit a toggle to get your arrow keys, that's a poor second-best choice, IBM notwithstanding. Second, if the arrow keys are lined up in a row, that's also second-best. They *should* be in a diamond shape, so they can be used without looking. L-shaped or inverted-T-shaped key arrangements are somewhere in between.

Key Break or Keyclick

There is no mechanical connection between the keyboard and the monitor. With a typewriter, the whole thing shakes as you type, so you know whether the key you hit registered. Not so with a computer; it is eerily quiet. A computer feels like an electric typewriter with the power turned off.

Some computer makers design special clicks and "breaking resistance" into their keyboards so you'll know by feel or by audible signal when the key has registered. This is highly desirable, but rare. Keyboards with no click or break are called "soft" (not to be confused with "soft" keys, defined below).

Not everybody likes breaking keys or audible keyclick. You'll have to try it yourself and see if you like it. If you get a computer with audible click, it helps if you can turn the click noise off or turn it down.

Soft or Function Keys

Big expensive computers have extra keys around the keyboard to handle special computer functions. Most personal computers can't afford that kind of limitation, so they use special codes instead. You access the special codes by holding down a special "control" key and pressing an ordinary alphabetic key. That way keys can serve two or more purposes,

which reduces the number of keys, and the cost, and the consumption of precious keyboard space.

To make things easier on the poor user, most computers have at least a few extra "function" or "soft" keys, commonly labeled "F1" through "F5" or "F10." You can "program" these keys to perform special functions for you, including entering a long series of commands on one keystroke. For example, if you're writing about the Atchison, Topeka & Santa Fe Railroad, you can program one key to type this phrase in the text every time you hit it, rather than retyping the words over and over.

Other computers get this same effect by offering the numbers on the 10-key keypad as alternate function keys in combination with the control key. Either method seems to work equally well, and function keys are a tremendous advantage.

Look for function keys that you can easily change. Some computers require you to enter special computer code sequences instead of just typing in "Atchison, Topeka & Santa Fe Railroad."

Similarity to Standard Keyboard

If you are an experienced typist, the keys on your computer should be in the same places they are on your typewriter. There may be lots of other foreign keys crowded around them, but the "return" key, the "shift" and the "shift lock" keys should be in their expected places. The IBM Personal Computer was introduced with "Return" and "Shift" keys slightly out of place, and caught an incredible amount of flak about it from people who kept pounding the wrong keys by accident. Many IBM imitations have the exact same flaws in their keyboards.

There are specialty keys, and some of the regular keys may have extra symbols on them. The more these special keys and special symbols appear self-evident in their purpose, the better.

Finally, certain extra keys should be oversized, or carefully placed: the "delete" key (if any), the "return" key, and the "control" (CTRL) key. Pay close attention to where the "Control" key is: on a computer, you use this key all the time,

so if it's hard to get to, you'll be sorry. Unfortunately, few computer makers pay much attention to these things.

Keypad

If you do a lot of work with numbers, a 10-key numeric pad can be a great convenience. Otherwise, it is of little special use to you. Some of the smallest computers double them up on alphabetic keys to save room.

Feel

Try the keyboard out to see if you like it. If you're used to typewriters, a computer keyboard will seem very strange at first. But you'll get used to it—honest. In fact, you will come to prefer it, and your typewriter will end up in a corner where it will slowly rust from disuse. Really. If that seems incredible, just remember your first encounter with an electric typewriter after years of using a manual: how could you ever get used to something that jumps at you, and types when you're not looking? A computer is the same way. Eventually, you'll love it.

But try it first. Compare the feel of the keyboards of different models. Some like them stiff, some like them soft. Find out what you like.

DISK DRIVES AND OTHER FORMS OF DATA STORAGE

Because the computer memory (RAM) forgets everything when the power is turned off, you need some method of storing data. Otherwise you'd have to re-enter your entire mailing list every time you turned on the computer. You also need some way of putting new programs and new data into the computer.

The Portable Difference

Notebook and Briefcase Computers Space and weight are the watchwords with these smaller portables, and considerable ingenuity is expended devising means of portable mass storage more closely approaching the ideal of no volume and no weight. The results to date are interesting: ROM, special

battery-powered RAM chips, bubble memory, cassette tapes, and cartridges.

Microcassettes, like those in miniature dictating machines, were an early idea. The computer translates its data into sound and the cassette records it just like music. Cassettes are cheap, hold a lot of information, and are removable. The principal drawback is speed: cassettes take forever to record or load even small programs or data files.

Bubble memory is another approach, an exotic technology that stores electric signals in a chunk of plastic smaller than a pack of cigarettes. Bubble memory is solid-state, has no moving parts, and is impervious to dust and shock. It holds far more data than a microcassette, yet is as fast as a disk drive. It's also removable, like a cassette or disk.

But bubble memory is expensive. A 128K module costs over a hundred dollars, compared to two dollars for a microcassette or four dollars for a floppy disk. Some specialized and expensive notebook computers (Teleram and GRiD) use bubble memory, but mass marketing still awaits a cost breakthrough.

The latest rage in data storage for portables is **CMOS** (complementary metal oxide semiconductor), a special kind of RAM chip with very low power requirements. With CMOS RAM, you can turn off the rest of the computer and keep the RAM powered up and maintaining its data for up to a month using only a tiny watch battery. CMOS RAM is tiny and light, the battery needed to power it is miniscule, and of course the RAM is doubling as active memory and as mass storage, approaching the ideal of no weight and no space consumed for storage. In addition, RAM storage is fast, since the information is already in RAM.

The disadvantage is that when you run out of RAM space you're stuck until you unload the RAM contents into real, off-board storage. At the moment, this is done on tape or plug-in disk, or by modem, sending the information to another, larger computer which can store it on floppy disks. Some briefcase computers use CMOS RAM and also have a single miniature disk drive, or a detachable disk drive, combining the best of both worlds.

There are notebook and briefcase computers that accept special cartridges as substitutes for cassettes and bubble memory. They operate the same way as the game cartridges

on a home video game; you plug them into the computer and run them. These cartridges contain ROM chips which cannot change their information, so they are used only to load, not store, data. Battery-powered RAM cartridges are the newest wrinkle. They contain a program in changeable RAM and are kept going by a battery built into the RAM cartridge.

Transportable Computers The larger transportable and all desktop computers use disk drives for mass storage. Disk drives use magnetically sensitive, flexible Mylar plastic disks, called variously minifloppies, floppy disks, diskettes, or microdisks. These disks are generally referred to as "floppies" because they are flexible, to distinguish them from inflexible aluminum-base "hard disks."

Figure 3-2 shows a typical computer disk and the drive unit that uses it. The disk drive is usually built into transportable units, not a separate component as in desktop models. The most common size in portables at the moment is $5\frac{1}{4}$-inch disk drives. New, and probably the wave of the future, are a group of sub-four-inch disks (sizes are 3", $3\frac{1}{4}$", $3\frac{1}{2}$", and 3.9"). All disks are wrapped in a permanent plastic sleeve to protect them against dust and fingerprints. Most sub-four-inch disks are encased in hard plastic holders, providing better protection.

The disk stores information in the form of magnetic

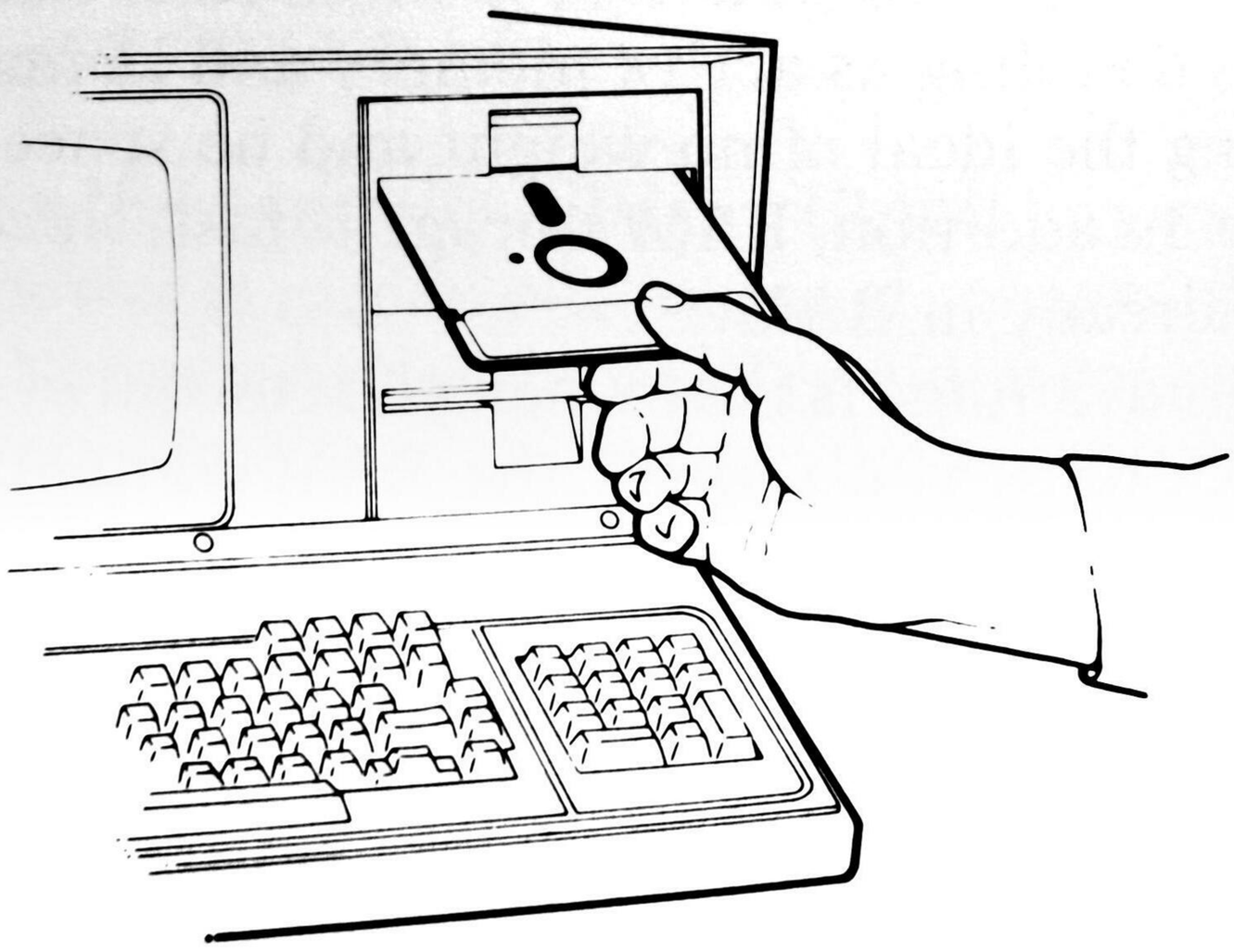


Figure 3-2. **A $5\frac{1}{4}$-inch floppy disk being inserted into a portable computer disk drive.**

signals on the plastic surface of the disk. As far as the average user is concerned, a floppy disk is just a kind of flattened cassette tape, and the disk drive is just a kind of tape deck.

Like cassettes, floppies come pre-recorded with program material, or blank for storing your own information. You use disks by putting them in the disk drive and pressing a few buttons on the keyboard. The computer plays the recording from the disk into the computer memory, or records information onto it from computer memory. That is how the computer obtains prerecorded programs or stored data.

Programs on pre-recorded disks cost anywhere from $29.95 (for games) to over $1000 (for elaborate business accounting systems). Blank disks run from $2 to $8, depending on the quality of the disks and whether you buy retail or mail-order (there is less difference in quality than the price differential would imply).

Exactly how to operate your disk drive is explained when you buy the computer, so we won't describe that here. Any computer store will be happy to demonstrate this if you're curious. The real issues for this component are storage capacity and format compatibility.

Capacity

Disks store between fifty and several thousand pages of information, depending on disk size, density, and what is being stored (word processing text files take up more space than numerical data files, for example). Disk capacity is a function of the disk drive, not of the disk itself.

Disk storage capacity is measured, like RAM, in K, or thousands of characters: 185K means 185,000 characters of storage capacity. Here are some storage sizes:

- about 185K for "double-density" disk drives (this is a common size);
- around 320K to 400K for "double-sided, double-density" (also common);
- about 750K for "double-sided, double-density, double-tracking" disk drives (rare).

Don't worry about the "double-double" terms. Look for the "K" number indicating total "formatted" storage capacity. The Rule in disk drive capacity: the more the better.

If your computer uses disk drives, two is considered both the minimum and the ideal number. You need two in order to make backup copies of your disks conveniently.

Format and Compatibility

Exactly how the magnetic signals are stored on the floppy disk—in what pattern and order—can and does vary from computer to computer. The lack of one standard floppy disk drive format in the $5\frac{1}{4}$-inch category is the scandal of the microcomputer industry, and it appears that the new sub-four-inch drives will likewise be a hodgepodge of formats.

Lack of a standard is important because one computer can't read another computer's disks if the disk formats are different. This is an entirely separate issue from whether the computers have the same operating system. Two CP/M or MS-DOS machines can be identical in every other way, but if their disk formats are different, they can't use one another's disks.

This means every software house must carry its programs in one of every popular format on the market. Naturally, only the most popular formats have the widest selection of programs available. Less popular computers are stuck in a uniqueness warp.

Each maker hopes to establish its own standard and force everybody else to follow along. So far it hasn't worked, except for IBM. So many IBM PCs have sold that everybody is making imitations, and the imitations have to use the IBM format.

Many CP/M portables, however, are able to read other disk formats. Currently the Xerox 820 single density disk format is the closest thing to a standard in CP/M. It is a distinct advantage if your computer can read Xerox 820, because that means more software will be available.

Sub-four-inch disks have the same problem of format incompatibility, and the added problem of being an entirely new size. At the beginning of 1984, this size disk was still too new for there to be much software available. The obvious size and weight advantages are so great, however, that sub-

four-inch drives will eventually replace the larger competitors, particularly in the portable computer field. Expect to see a lot of action in this area in 1985. In the meantime, make sure the software you need right now is available right now on sub-four-inch disks if you want a computer that uses them.

Hard Disks

Hard disks are popular because they hold so much information (they are measured in megabytes, or millions of characters of storage) and because they are so fast—ten times faster than floppy disks. On the other hand, they are expensive ($1000 to $3000) and very delicate, especially when it comes to vibrations. That makes people suspicious of the idea of hard disks built into portable computers.

But your hard disk need not be built in. You can attach an external "Winchester," as the small hard disk units are called, to your computer through one of the parallel ports if you need high capacity storage. Hard disks also speed up sorting and other disk operations, so they are a good way to speed up your existing computer short of buying a new processor.

Prices for hard disks are still high, but are expected to drop during 1984, and the amount of storage you get for your dollar will rise considerably. Already the Kaypro 10 offers a hard disk built into the Kaypro portable for a price similar to what you'd ordinarily pay for the disk drive by itself; in effect, they throw in the computer and software for free.

INTERFACES

An interface is an outlet or connector on the computer that hooks up to an external device. You need an interface to connect your computer to a printer, an external monitor, a hard disk, a telephone modem, or a scientific measuring instrument. These external devices are called peripherals.

Desktop computer makers often charge extra for interfaces, even though you need at least one interface for your printer. This is a classic gambit of computer retailing: offer the "computer" at a temptingly low price, then charge an arm and a leg for the "extras" that are required to make it run. This is like selling cars and offering tires as "extras."

Portable computer makers, on the other hand, almost always offer a minimum of one interface as part of the basic package, which is another reason portables are a good buy beyond their mere portability. Thank Osborne for another pioneering marketing idea in computers, in addition to such radical notions as making the hardware complete, including necessary software, and charging a low price.

Interfacing (connecting) a computer to any kind of outside device can be frustrating, because it involves electronics savvy of the kind that few beginning computerists possess. You have to worry about the style of interface port (slot that a peripheral is plugged into) at both ends, and the exact arrangement of the connecting wire—and when that's all settled you've only begun, because you must also figure out the computer signals that both devices (computer and peripheral) will send and receive. For this reason, we advise you to get an expert (the dealer, or a knowledgeable user group member) to hook up your computer, modem, or hard disk, even if you have to pay for it.

When it comes to choosing among portables, you want to find out how many and what kind of interfaces are given away free, and how many and what kind can be added later.

Luckily there are two main kinds of interfaces: the serial interface, which goes by the designation RS-232C; and the parallel port, which may be called the Centronics or the IEEE-488 interface, depending on exactly how it's wired and what kind of plug is fitted to it. How and why these interfaces work is a mind-boggling and tedious subject to most folk. The short explanation is this: a serial port sends information down a wire one bit at a time, whereas a parallel port sends it eight bits at a time in parallel, down a flat ribbon of wires. Don't worry about this distinction: what is important is how they are used.

A **SERIAL PORT** is: *required* to hook up a modem; *required* if you must hook up a printer more than a dozen feet away from your computer; the most common, but *optional*, interface for letter-quality daisy-wheel printers (you can use a parallel connector instead).

A **PARALLEL PORT**, on the other hand, is: *required* to hook up an external hard disk; the most common, but *optional*, port used for dot-matrix printers (you can use a serial

cable instead). The parallel cable can only be about eight feet long.

The big question is: what free interfaces do I get? The minimum number of ports you want is one, the standard is two, and the ideal is three, of which one is a modem plug.

The original Osborne threw in a free parallel port, plus a serial port, plus a modem port (custom, unfortunately), plus a special battery connector, plus an external monitor port. When they said "complete at one price," they weren't kidding.

The typical portable these days offers two ports: one serial and one parallel. This is a good, all-purpose combination. Sometimes an extra serial port is thrown in so you can hook up your modem and daisy-wheel at the same time.

At a minimum, you need one port to hook up your printer. Make it a serial interface if you plan to double up a modem on that port, or make it parallel if you plan to get an external hard disk some day.

You can usually add extra ports to a desktop computer, but portables are often sealed units. What you see is not only what you get, it's all you can get. So your computer should either have all the ports you can imagine you'll need, or it should allow you to add more ports later when your requirements change.

The Portable Difference

Ports are usually included in notebook and briefcase computers because they are nonexpandable and electronically unique, so whatever you might need has to be included from the start. Some of these computers have ports that only hook up to their own specially-designed printers and modems. This means you'll pay more for your peripherals than you would if the ports were standard. On the other hand, the manufacturer's peripherals probably complement its lightweight, highly portable computer better than standard peripherals would.

Some computers in this size have built-in modems, complete with the built-in software to run them. This is *extremely* convenient.

PRINTERS

Printers, usually external to the computer, are of three types: **LETTER-QUALITY** (usually daisy-wheel or thimble-wheel), **DOT-MATRIX**, and **THERMAL**. Any portable computer can run any of these printers, so there is no need to tailor your computer selection to your choice of printers.

Whatever your choice, you will inevitably balance your individual requirements and personal taste with price. If you don't know what to buy, start out modestly and inexpensively, then work your way up as your printout requirements and tastes become clear.

Thermal Impact

Thermal impact printers are dot-matrix printers that work with chemically treated paper which changes color when heated. The print head presses heated wires against the paper, burning the character into the paper. Quality is poor but thermal impact printers are small, light, cheap, and quiet. They are used where these qualities are of primary importance. Don't buy a thermal printer if you want to send letters to clients: the quality of the print is just too poor.

Thermal Transfer

A new kind of printer used on the Gavilan and Sharp notebook computers is the thermal transfer printer. Here a special ribbon is used. The print head heats the ribbon, liquefying the ink slightly so that it transfers to the paper. The printing is considered letter-quality because the dots sort of melt together so the letters look fully formed. Plain paper is used, not chemically treated paper. Thermal transfer printers are as fast as daisy-wheel printers but much lighter and smaller and with fewer mechanical parts.

Dot-Matrix

These printers make letters out of dots. They are fast, generally cheaper than letter-quality printers, and of far better print quality than they were only a few years ago. If your image of dot-matrix print is the unreadable bank statements you used to receive in the mail, that image needs revising.

The number of dots per letter has increased, resulting

in much better print quality. Seven-by-nine dots and 9-by-9 dots are now the standard in the dot-matrix industry. Don't settle for less than 7-by-9. Specifically, don't settle for five-by-seven, the old standard that produced the horrors you remember from the past. There are a lot of these old 5-by-7s hanging around: don't get stuck with one unless you are printing only for yourself.

It is possible to buy a perfectly acceptable quality dot-matrix printer for under $400 retail if you shop around. What you sacrifice as the price goes down is mainly speed, one of the dot-matrix printer's big virtues. The more expensive (up to $1000) dot-matrix printers offer three speeds: slow, for nearly-perfect, top-quality print; fast, for good print; and super-fast, for draft-quality print.

Whether a dot-matrix will suffice for all your printing needs only you can tell. Most people are initially horrified at the idea of sending a dot-matrix letter. But when they see how fast these printers can be (especially when compared to daisy-wheel printers), and how much the quality of the print has improved (when a fresh ribbon is used), they have second thoughts. Most wind up buying one after all.

Dot-matrix printers can also produce graphics, which is handy if you are producing graphs, pie charts, and scattergrams. They can print at 6, 8, 10, 12, and 15 characters per inch, produce italics, and with special software even construct Old Gothic typestyles. All this can be quite addicting and makes high-quality daisy-wheel printers look dowdy by comparison.

There are also ink-jet printers, which shoot droplets of ink at the paper. The more expensive versions are even faster than mechanical dot-matrix printers, and much quieter. Some are already selling for less than $1000, so they may become more common during 1985. They also produce dot-matrix-style print and can easily produce text and graphics in four colors.

Letter Quality

Daisy wheels and thimbles are the two common technologies for letter-quality computer printers. They are variations on the same theme.

Daisy-wheel printers print something like a Selectric typewriter, except that instead of a ball typing element, they

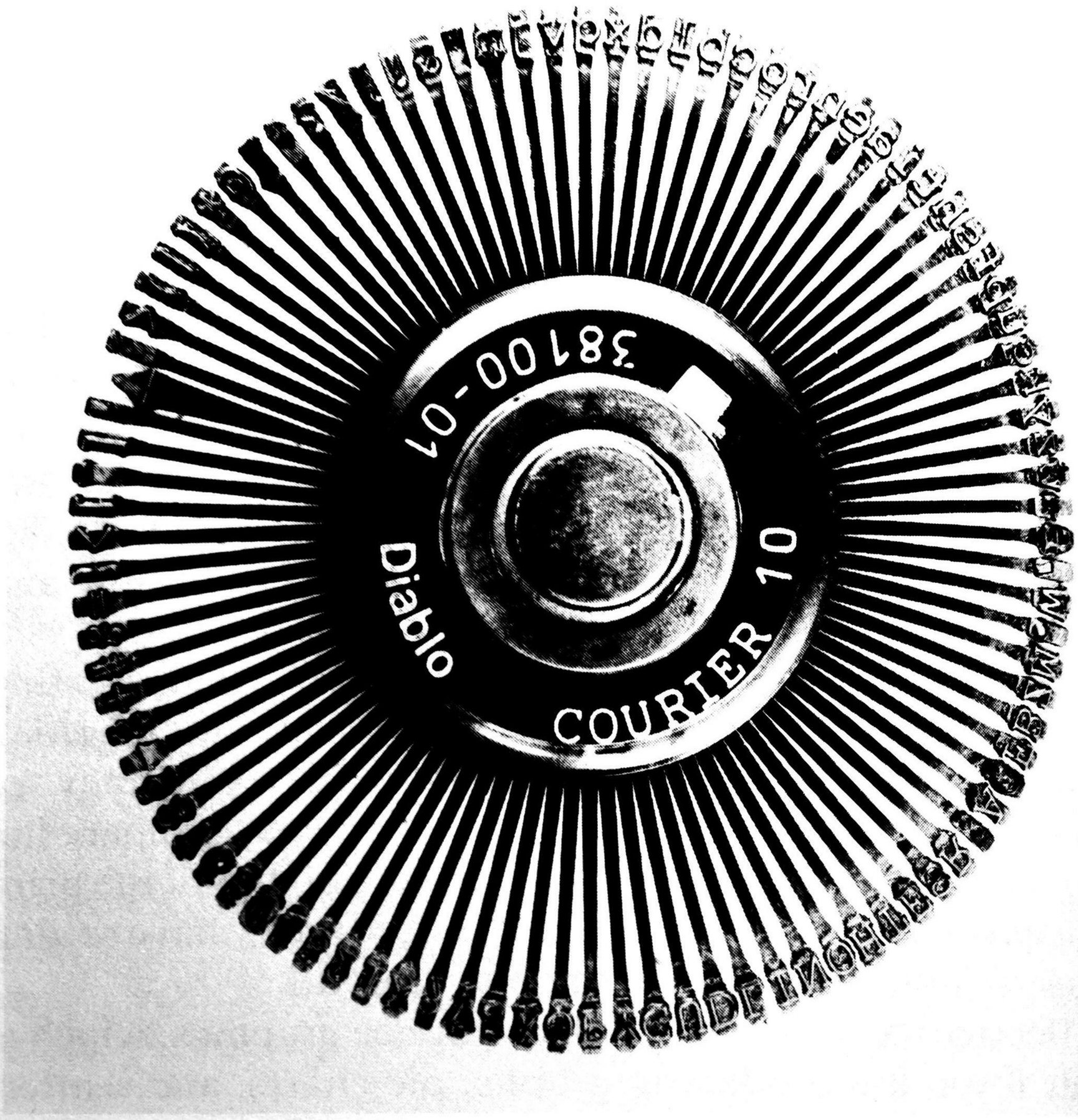


Photo 3-5. Daisy wheel for letter-quality printer (Diablo).

use a wheel with the letters on the end of the spokes. The wheel resembles a daisy. A thimble printer does the same, but the petals are bent into a cup.

In either case the wheel or cup spins as it zips back and forth across the platen. When the required letter whirls by the appropriate place on the paper, a tiny hammer swings out and smacks it against the paper. The engineering precision required for this feat boggles the mind.

The daisy-wheel and thimble printers are generally more expensive than dot-matrix printers. Among comparably priced models, dot-matrix printers are always faster. The quality of the daisy-wheel and thimble type can be breathtaking. Using proportional character printwheels (and the proper word processing software), they can produce printouts that rival typesetting.

Like dot-matrix printers, daisies print at 10, 12, and 15 characters per inch, your choice by switch or by software. You can buy several printwheel styles and get the computer to stop while you change printwheels. Some very expensive daisy-wheel printers even have two printwheels so you don't have to stop at all: the printer knows which one to use. Yes, printers have become quite computerized themselves these days.

Some printers also come with "buffers," data storage units like RAM, ranging from 2K to 64K in size. When you send a document to the printer, the buffer holds the data and frees up the computer so you can work on something else while the printer is busy. Very handy. Buffers are built into printers such as the Daisywriter, or can be purchased for $150 to $500 for virtually any printer on the market, dot-matrix or daisy-wheel.

Both dot-matrix and daisy printers are getting quite inexpensive (compared to the recent past): under $300 for a dot-matrix printer, under $600 for a respectable daisy. The main selling point of the daisy is quality of print. The main selling point of the dot-matrix is speed: they average two to four times faster. One hundred ten words per minute (wpm) for the slowest daisy on the market may seem quite fast if you're a twenty-wpm, two-finger typist, but within six months you'll think 110-wpm unforgivably pokey: computers breed speed addicts.

It is possible to hook up your Selectric-style or daisy-wheel typewriter to a computer. The result works fine, doesn't seem to harm the machine (contrary to rumor), and runs amazingly slowly. The price of the interface is such that it only makes sense if you already own such a typewriter.

There are also super-high-speed laser and photocopier technology printers, but at $20,000 and up they are beyond the scope of this book. (Besides, nobody would lend us one for review.)

MODEM

A modem is a device, built in or attached separately, that lets your computer talk to another computer via the telephone. Acoustical modems have rubber earcups that you

put the telephone handset into. The computer makes noises and communicates through the telephone just like you would. Direct-connect modems plug directly into the telephone: you unplug the cord from your telephone and plug it into the computer modem. They are more reliable than acoustical modems because there's less outside noise interference. If your portable doesn't have a built-in modem, you'll need a *serial port* on your computer so you can hook one up.

Modems come in two speeds: 300 **BAUD** (bits per second), or about 30 characters per second, which is the most common and least expensive speed ($65 to $200); and 1200 baud, four times faster and much more expensive (commonly around $500). Information services like The Source and Dow Jones charge twice as much if you use a 1200 baud modem, but since the modem is four times faster, you still come out ahead.

You can use a modem to hook up to a large national data base, such as The Source, where you can order airplane tickets, look at the UPS wire service, or leave messages for other computer users. The Dow Jones data base will give you the stock exchange quotes (fifteen-minute statutory delay), the contents of the *Wall Street Journal* for a month, and *Barrons*. Dialog, a giant bibliographic data base in California, has references to tens of thousands of scientific and engineering publications.

You can also call a friend who has a computer (or a terminal) and modem, and transfer data files. You can't transfer programs unless your friend has the same general kind of computer you do (the program will transfer, but it won't run on the foreign computer). The text of this book, for instance, was transferred back and forth between the authors, who live forty miles apart. The telephone bills can get quite interesting.

To run the modem, you need software in the computer so the computer will know enough to use the modem. There is lots of modem software around, including free modem software obtainable from computer user groups. Notebook computers often have their own modem software built in. There are two considerations concerning modem software. First, is it easy to use? Second, is there some easy way to perform the "log on" procedure in a few keystrokes? (You normally have to enter lots of code numbers to connect up

with the giant data bases; a modem program or computer that lets you store the log on sequence in a few keystrokes will save time and improve accuracy.)

SOFTWARE

A computer isn't a single-purpose machine, like a can opener. It has no particular purpose at all. It's the most general-purpose machine ever invented. That's both its power and its challenge.

A computer can: calculate, count, remember, sort, distribute data, and print (or transmit). *What* it calculates, counts, and remembers is up to the software. You pick the software that makes your computer do word processing (to write a letter) or distribute information (in your accounting program) or play a game. The computer is a jack-of-all-trades, and master of every one, with the right software.

Let's look at the differences between hardware and software.

Hardware is the machine itself, the solid parts, what you can rap with your knuckles. (That's why it's called hardware—because it's hard.)

Software means programs, or computer instructions. Software makes the computer do something: check spelling, keep books, teach French, do accounting. Software makes the computer run, and without it the hardware is useless. Like a record player with no records, a computer without software is just "iron," as the computer industry calls it—an expensive doorstop consuming electricity.

Software is "soft" in the sense that it isn't hardware; it's not any particular piece of equipment. It may be stored, in the form of electrical charges, on a floppy disk, a tape cassette, a cartridge, or a microcomputer chip. But the disk is not the software, just as the record isn't the song: it's just a storage device for the song. To hear the song, you play the record. To run the program, you play it back into computer memory.

Hardware and software are different, but they're so closely tied together that it's hard to talk about one without the other. A modem lets the computer send messages over the telephone, but to make it work you need both the physical

modem device which creates the signals, and the modem software which determines what signals will be created.

In Chapter Four we'll discuss specific groups of software found on portable computers.

Other Portable Hardware Buying Considerations

There are a few more specific items you'll want to watch for when it comes to portable computers.

Size

Portables are generally smaller than desktops, and this means they take up less desk space, which can be a great advantage if you use your desk for something else besides computing. In addition, the fact that you can easily snap the portable closed and put it aside means a portable may save you the expense of special computer furniture.

The "fits-under-an-airline-seat" portables may not, in fact, fit under all airline seats. If you plan to fly with your computer, it's important that you carry it rather than ship it in baggage. It is a delicate electronic instrument, even if it does have a handle on it. If it doesn't fit under the airline seat, you have to ensure that there's space in the cabin closet. That's the principal reason size is important.

Weight

If you move your computer more than a few feet, dead tonnage will be a consideration. The 25-pound-and-up portables are hefty for the average male or female, and a trip out to the car and back is about the limit of its portability, so don't make plans to lug one eight city blocks. Even a GRiD Compass in your briefcase can start to drag you down after a long hike. Only the notebook computers, at under five pounds, are truly portable. If you plan to move your computer seldom, and then only short distances, you need only assure yourself that you can get it off the desk without dropping it.

Ruggedness

Again, if you plan to lug your portable around frequently, check the integrity of the case and construction. We mention this factor in our reviews, looking for the likelihood that the case can be banged without snapping off, and the interior components can be jostled without falling apart. Special touches, such as a disk drive head that locks down, are noted in the reviews.

Battery

There are portables intended to run on batteries, and portables not really intended to run on batteries. While there are batteries available for the Kaypro and other transportables, for example, they last only an hour or two and are really intended only for backup.

The notebook computers, on the other hand, must be able to run on batteries for extended periods because those computers can be taken and used anywhere at all. Eight hours or more of use should be expected as a minimum, with the computer able to be used during recharging. Removable battery packs are ideal.

Display Clarity

We spoke of display types earlier in this chapter. Because displays on portables are necessarily smaller than those of desktop computers, take extra care to note the display on the computer you consider. Personal tastes vary, as does eyesight, leading to some nonintuitive selections. For example, we know someone with bifocals who finds the tiny screen on the Osborne 1 ideal because the entire screen falls within the field of vision of the lower half of her glasses. The flip side of that is the individual who likes the cumbersome 52-character line of the O1 because, when piped onto a 12-inch external monitor, the words appear much larger than they do even on a desktop computer.

There's no accounting for tastes, so check it out yourself.

Expandability

This used to be the most important consideration in buying a computer: is it expandable? The concept of expandability

has changed somewhat recently. It started out when most computers were sold as desktop 4K RAM machines with no disk drives, a television set for a monitor, and no ports. Expandability meant you could increase memory to 48K or 64K, switch to a monitor when you had the money, and add one or more disk drives, not to mention ports for printer and modem.

Today the typical portable comes not only with 64K memory built-in, two disk drives, and a monitor, but also with a complete set of interface ports sufficient to keep the average user happy for years. The main reasons for expandability have been overrun by progress. This makes expandability much less important than it was only three or four years ago.

Still, most portables can at least expand to add a long list of external devices through their ports—devices such as hard disks, printers, modems, and in some cases scientific measuring instruments.

Of the 8-bit computers, only the ones labeled "S100 bus" or "STD bus" accept internal expansion of RAM. The 16-bit IBM-imitation portables are all made to allow expansion of RAM to 256K or 512K maximum. This reduces the likelihood of their becoming obsolete when the day comes that lots of programs using this kind of memory are available.

All of the above factors, which are more important to portables than to desktops, are addressed in the product reviews.

Obsolete Computers and Defunct Companies

The whole idea of computer absolescence is something of a marketing joke. People write off 8-bit computers as useless antiques good only to be handed out to schools, yet most people can hardly handle the existing power of these very computers.

Computer-ignorant marketing people have persuaded the naive public that if a computer becomes "obsolete" any time in the next five years, it will have to be thrown away! This is utter nonsense. Few users, no matter how ambitious, manage to press their computers to their limits. Even obsolete 8-bit computers are extremely powerful.

There is another question that is a bit more serious,

however: what happens when a computer company goes out of business? If hundreds of thousands of a particular computer have already been sold, there will probably be a market of support available to fix the computer and provide software for it. That's why we recommend that beginners buy established, well-known computers, rather than trying to be the first on your block to buy state-of-the-art, hot-off-the-shelf machines.

Otherwise, bear in mind that computers using standardized parts are going to survive the longest. This is the principal selling point of the "S100 bus" computer, a kind of computer with an industry standard connector inside it. You can always get standardized replacements for failing equipment.

Chapter Four

Applications: What to Do with a Portable Computer

Introduction

A portable computer can do what any desktop computer can do. Smaller portables may have more limited memory or storage capacity, but all computers perform the basic activities of counting, sorting, remembering, printing, and distributing as described in Chapter Three.

Because computers are general-purpose machines, the variety of uses to which people put them is limitless. But to reduce the issue of computer applications to manageable size, we'll talk specifically about how people use portable computers in six principal areas, and the kinds of demands these applications make on portable computers.

The six major uses of personal computers are:

1. WORD PROCESSING, in which you type your letters, memos, or Great American Novel on the computer screen instead of on paper. One of the two best-selling programs of all time is a word processor.

2. ELECTRONIC SPREADSHEETS, like word processing programs, computerize an existing business activity: making spreadsheets consisting of rows and columns of numbers. The other best-selling personal computer program is a spreadsheet program.

3. FILE MANAGEMENT AND ACCOUNTING programs turn your computer into an electronic file cabinet. You put your business or professional information in the computer instead of on index cards or in file folders. The computer keeps track of everything, sorts the files into any order you desire, prints reports a dozen different ways, and reduces the amount of duplication. This is an area of growing popularity. We include in this category basic accounting programs.

4. TELECOMMUNICATIONS, in which you use a modem to allow your computer to communicate with another computer via telephone. Telecommunications gives you access to other, larger computers with gigantic libraries of information, data, and statistics.

5. PERSONAL PRODUCTIVITY, a grab-bag category which includes all the other programs that computerize, organize, and upgrade your personal and business life. Personal productivity software is used by you, personally, in your work, and includes calendar and scheduling programs, statistical and engineering programs, indexing, graphics and portfolio programs, as well as home accounting packages, games, and education.

6. PROGRAMMING. Once upon a time, you needed to be able to program a computer to use it effectively, but no longer. Pre-written, off-the-shelf programs are reaching new levels of sophistication, driving programming languages (once king of the personal computer software categories) into obscurity. We'll talk a bit about programming languages and why BASIC is still included in portable computer software packages.

By the end of this chapter you'll be able to make sense of our reviews and of others in magazines.

Word Processing

How It Works

Word processing (WP) programs computerize your typing. There are WP programs suitable for writing interoffice memos, for formal letters, for draft proposals, for lawyers' pleadings,

for lengthy engineering reports, and for creative novel writing. Word processing programs are good for anybody who spends any time at a typewriter.

The following illustration shows what you see on the screen when you use a typical word processing program like WordStar, which will give you an idea of how a word processing program works. The area at the top of the screen is the Help menu, a list of the commands you have available. The "^" sign means "hold down Control key," so that "^A" means "hold down the Control key and press the letter A."

SAMPLE WORD PROCESSING DISPLAY SCREEN

```
        B:CHAPT4.1ST  PAGE 1 LINE 21 COL 38          INSERT ON
CURSOR:     ^A=left word      ^S=left char    ^D=right char   ^F=right word
            ^E=up line        ^X=down line
SCROLL:     ^Z=up line        ^W=down line    ^C=up screen    ^R=down screen
DELETE:     DEL=char left     ^G=char right   ^T=word right   ^Y=entire line
OTHER:      ^V=insert off/on  ^I=tab          RETURN=end para ^U=stop
            ^N=insert a RETURN ^B=reform to end para    ^L=find/replace again
HELP:       ^J displays menu of information commands
PREFIX KEYS     ^Q ^J ^K ^O ^P  display menus of additional commands
L----!----!----!----!----!----!----!----!----!----!----!--------R
In this example of a word processing screen (WordStar), the
material above the "L---!---!R" dotted line is the help menu.
You type your letter in the area below the dotted line. The
program automatically takes care of carriage returns, and lines
up the right side of the text as you type. Corrections are made
by backing up with the delete key, or by moving the cursor to the
error and using one of the delete commands, then typing in the
correct item. The paragraph is reformed with ^B.

When the letter is completed, you save the document on the disk
with ^KD (hold down the Control key and press the letter K, then
press the letter D). The Main Menu appears, and you follow the
instructions to request a printed copy. It's easy!
```

Word processing is one of the most popular uses for a computer, because the computer takes care of the most tedious parts of writing and typing: making corrections, retyping drafts, printing out another original, moving text around the document, and making minor variations in a series of documents that are largely the same. A computer also makes much nicer-looking originals than a typewriter. Text can be right justified (lined up on the right margin like a newspaper) and even proportionally spaced so that it al-

most looks typeset. (There are also programs that will check the spelling and punctuation of your word-processed document, and even help do indexes and footnotes.)

Typesetters around the country are gradually adapting to the widespread use of personal computers. It is now possible to send your book to a compositor on disk or via modem (over the telephone lines), greatly reducing typesetting costs, printing time, and typographical errors.

Portable computers that bundle free software almost always include a word processing program. The two most popular programs distributed this way are WordStar, the best-selling program in the micro world, and Perfect Writer. Appendix A contains detailed reviews of these two popular programs.

Other powerful word processing programs you may hear about include Pie:Writer for MS-DOS (IBM-compatible) or Apple computers; Spellbinder, a CP/M program noted for its powerful printing capabilities; Easywriter, a much-criticized program sold for the IBM PC market; Peachtext (formerly Magic Wand), and Volkswriter.

The Portable Versus the Desktop Computer

The only substantial difference between the typical transportable computer and the typical desktop computer when it comes to word processing is the size of the display screen. A maximum of 9 inches is offered by portables, but 12 inches is common for desktops. Keyboards and disk storage capacity are usually comparable, and a full range of word processing programs is available for portables running CP/M or MS-DOS operating systems.

Briefcase-sized portables commonly use proprietary operating systems and thus limit you to software the maker has translated for the machine. Software available for sub-four-inch disk drives will be limited through the first half of 1984, until these sizes become more widespread.

Notebook-sized portables are generally confined to one built-in, simple word processor not intended to provide a full range of WP capabilities. Notebook portables are intended as note-taking devices, not full-fledged office word processors.

Limitations on available word processing software are indicated, where relevant, in the reviews.

The Portable Versus the Stand-alone Word Processors

With the better word processing programs, the average transportable microcomputer is comparable in power and ease of use to stand-alone word processing computers, and will cost well under $5000 even including the cost of one of the best printers on the market. Good stand-alone word processors cost $10,000 and more. True, some stand-alone word processors can provide ten to twenty percent more power or convenience, but that increment will cost you one hundred to two hundred percent more. And with some of the cheaper stand-alone models (Wangwriter, IBM Displaywriter), there is no particular increase in power and convenience at all. Besides, the portable is a full-fledged computer, while the stand-alone word processor is limited to word processing (unless you buy an add-on CP/M card). In our view, there is no reason to buy a stand-alone word processor when you can have more power for less in a portable micro.

Hardware Considerations in Word Processing

Word processing makes most of its demands on the screen size, the keyboard, and disk drive capacity (depending on what you are writing).

Screen size can be a personal consideration—there are still people who haven't bothered to get a larger external monitor for their 5-inch Osborne 1s—but if you plan to spend long hours in front of the computer, the larger the screen the better. Because of size and weight limitations, no portables have screens larger than 9 inches diagonally, which is marginally acceptable for daily work. Your portable should be able to connect to an external 12-inch or 14-inch monitor to save your eyes if word processing is a high priority. In any case, look at the computer screen or external monitor you plan to buy before you plunk down your cash.

The keyboard is vitally important if you're spending all day pounding on it. It must have the right feel, of course, and many people like audible keyclicks on their keyboards

(and many people hate them). Others prefer "breaking" keys (the key resists being pressed, then releases suddenly so you know when the key "took"). Others tolerate the more common "soft" keyboards (press down on a key and it just goes down, rather like an IBM Selectric with the power turned off).

A well-placed "control" key is important because word processors make more intensive use of them than do other programs. The same goes for the Delete key; it must be convenient for you. Ten or more "soft" keys you can program with common word processing commands are useful.

Disk capacity for most transportables is adequate for most word processing work. The more disk space, the less disk swapping required. A hard disk provides dramatically higher storage space, plus a tenfold increase in speed over floppies, although at considerable cost.

Notebook portables have more trouble meeting storage requirements. Generally, storage is in the form of low-power RAM or bubble memory. Both are in limited quantity (32K to 384K) compared to removable disk storage. Text files can chew up a lot of memory, so portables without disk storage can only be recommended as notebooks whose portability outweighs their deficiencies as full word processors.

Speed is another consideration in computer use. The size and speed of the CPU makes less difference in word processing than in nearly any other application: if you will be spending most of your time writing, the difference between 8-bit and 16-bit computers is negligible to you. Better options for increased speed in word processing are:

- hard disks, which greatly increase filing speed;
- a faster printer;
- a printer buffer, which frees the computer during printout;
- memory-mapped video, which greatly speeds up screen displays. To get memory-mapped video, the computer must be capable of it, and the program must implement it. To tell if your computer and program are memory-mapped, scroll through a few pages. If pages appear almost instantaneously, the program is memory-mapped,

otherwise it takes noticeable time for the next screen to be displayed.

We said earlier that word processing is good for anybody who spends time at a typewriter. In fact, word processing is good for anybody who currently dictates, handwrites memos or notes for someone else to type, or keeps extensive handwritten notes for private consumption. The increase in productivity can be dramatic, especially if you learn how to type. (There are also programs to teach you how to type.)

Electronic Spreadsheets

It's easier to show you examples of electronic spreadsheets than to explain them.

Sample One shows a simple spreadsheet: a check register. You enter the check number, item, and amount. The computer adds up the totals.

SAMPLE ONE: CHECK REGISTER

	A	B	C	D	E	F
1	Check Register					8/18/1983
2			Thursday			
3						
4	Check			Check	Deposit	
5	Number	Date	Description	Amount	Amount	Balance
6	==========	==========	==========	==========	==========	==========
7			Beginning Balance			$1,150.00
8		2000	Phone Company	930.00		$220.00
9		2001	Cleaners	140.00		$80.00
10		2002	Department Store	100.00		($20.00)
11					250.00	$230.00
12		2003	Pharmacy	65.00		$165.00
13		2004	Electric Company	250.00		($85.00)
14					900.00	$815.00
15						
16						
17						
18						
19	==========	==========	==========	==========	==========	==========
20	Totals			1,485.00	1,150.00	($335.00)

Sample Two is a little more sophisticated, and typical: a break-even analysis. Enter numbers in column B for Retail

Price, fixed and variable costs, and the computer will calculate your profit and loss per hundred sold. Change the retail price or any of the cost factors, and the program will recalculate all the profit and loss figures for you (it takes about two seconds).

SAMPLE TWO: BREAK-EVEN ANALYSIS

	A	B	C	D
1	Break Even Analysis		(SuperCalc)	
2			# Sold	Profit or L
3			100	-209850.00
4	Assumed Price (Retail)	525.00	200	-189700.00
5			300	-169550.00
6	Fixed Costs	(Totals)	400	-149400.00
7	Development	55000.00	500	-129250.00
8	Marketing	125000.00	600	-109100.00
9	Misc.	50000.00	700	-88950.00
10	TOTAL Fixed Cost	230000.00	800	-68800.00
11			900	-48650.00
12	Unit Costs	(Per Unit)	1000	-28500.00
13	Labor	88.00	1100	-8350.00
14	Materials	14.00	1200	11800.00
15	Packaging	10.00	1300	31950.00
16	Delivery	12.00	1400	52100.00
17	TOTAL Variable Cost	124.00	1500	72250.00
18			1600	92400.00
19	Quantity Increment	100	1700	112550.00
20	Discount Rate (%)	38	1800	132700.00

Sample Three is a profit projection for a year. Enter net sales for January, cost of goods, research and development estimate, etc., and the worksheet is calculated for the remaining months based (in this case) on growth factors such as a ten percent increase in sales and all cost factors per month. The result is an estimate of monthly net income, which can be projected for one or more years. If estimates are changed, just change the appropriate number in one place and the program automatically adjusts all other numbers. This is the sort of thing you'd need as supporting paperwork to get a business loan from your friendly neighborhood bank.

SAMPLE THREE: PROFIT PROJECTION

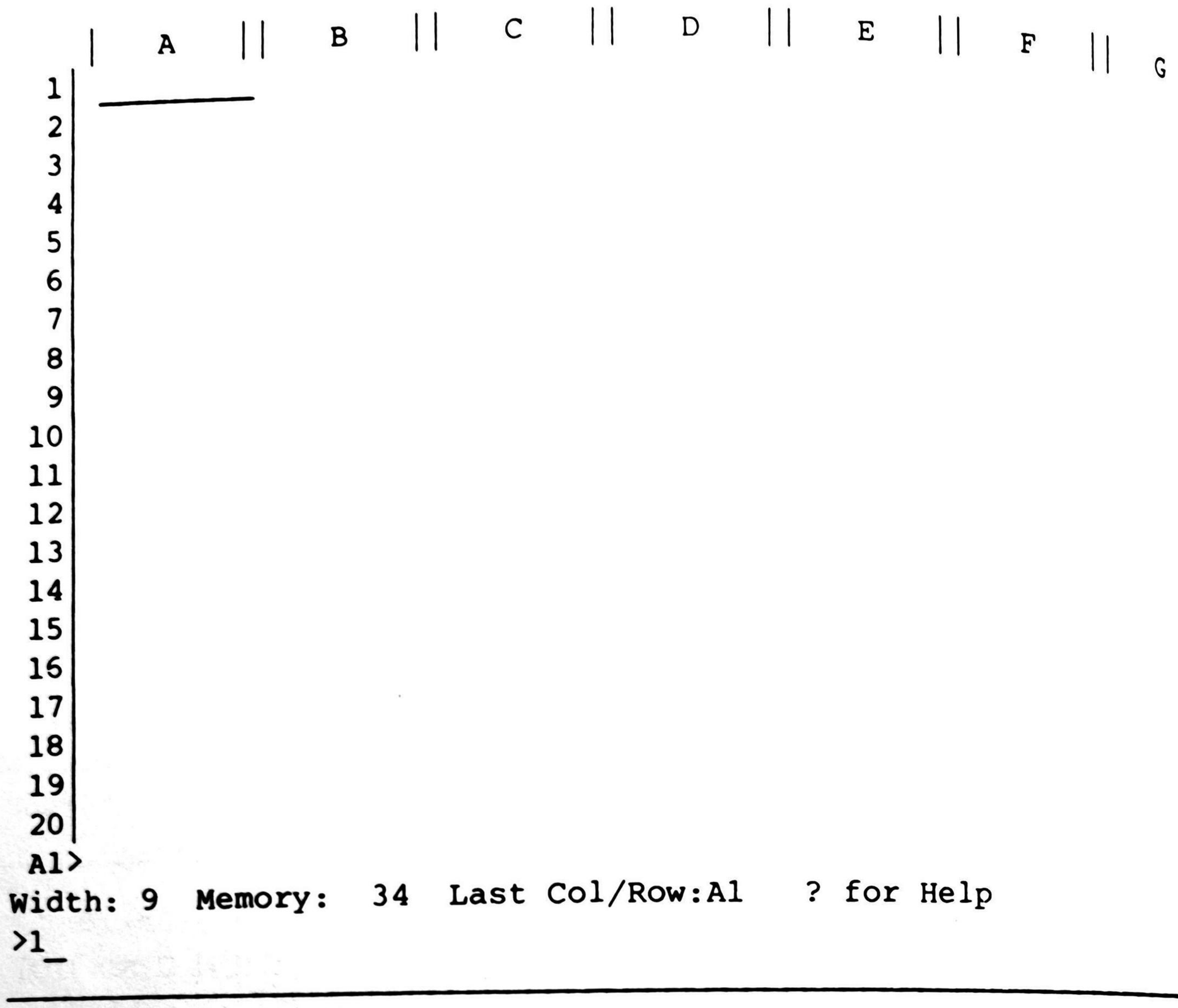
	A	B	C	D	E	F
1	THIS IS A SAMPLE SUPERCALC WORKSHEET					
2	10% PROJECTION; ALL FIGURES ROUNDED TO DOLLARS					
3		JAN	FEB	MAR	APR	MAY
4	NET SALES	$1000	$1100	$1210	$1331	$1464
5						
6	COST OF GOODS SOLD	300	330	363	399	439
7	----------	----------	----------	----------	----------	----------
8	GROSS PROFIT	700	770	847	932	1025
9						
10	RESEARCH & DEVELOPMENT	160	176	194	213	234
11	MARKETING	200	220	242	266	293
12	ADMINISTRATIVE	140	154	169	186	205
13	----------	----------	----------	----------	----------	----------
14	TOTAL OPERATING EXPENSES	500	550	605	666	732
15						
16	INCOME BEFORE TAXES	200	220	242	266	293
17						
18	INCOME TAXES	80	88	97	106	117
19	----------	----------	----------	----------	----------	----------
20	NET INCOME	$120	$132	$145	$160	$176

When you first load the spreadsheet program it does not, of course, display these samples (there will be samples on the disk for you to use, however). Instead, you get a blank screen divided into rows and columns, as in Sample Four. Move the cursor anyplace on the screen and enter the label or number, or the formula the program will use to make a calculation.

You can file your spreadsheet on disk, make copies, print them out, or make and print variations by the dozen. The savings in time is staggering. A three-year projection might take one or two days to create on paper, then several hours per variant to recalculate. With an electronic spreadsheet program you can create the same projection in an hour or two, and each variation can be made, calculated, and printed in three or four minutes (most of that being printing time).

You not only get faster information, you get more information since you are able to test variations that would not otherwise have been feasible due to time constraints; and the printouts look better, since they are all neat and clean and accurately calculated (no more whiteouts). Finally, there are fewer errors since the finished spreadsheet need not be given to the typing pool to mistype.

SAMPLE FOUR: A BLANK SPREADSHEET



These programs aren't just for accountants. People keep bowling scores, household inventory, and student scores on them because they're much more convenient than pencil and paper.

It is said that one such program, VisiCalc, single-handedly made Apple Computer rich and established the microcomputer as a serious tool for professionals. VisiCalc is the other most popular program, along with WordStar. And like word processing, "calc programs" are commonly included when software is given away with portables.

Calc programs are all very similar to one another—VisiClones, they've been dubbed, or CalcAlikes. Second and third generations of calcs are available, started by Multiplan, which introduces additional conveniences such as sorting by row and column, floating decimals and floating dollar signs, parentheses for negative numbers, and true rounding functions. If you have a serious need for a calc program, consider spending extra to get the second generation programs: VisiCalc Advanced Version or Lotus 1-2-3 (on MS-DOS computers);

SuperCalc3 and Multiplan for MS-DOS and CP/M computers are the top names in this area.

We've included a specific review of PerfectCalc in Appendix A since it is commonly included with portables.

Hardware Considerations

Calc programs can be convenient simply for keeping lists of numbers, even if you have no special need. In this case, don't bother adjusting your portable purchase decision based on the needs of calc programs. But if you plan to spend lots of time cranking out projections, bear a few things in mind.

First, the more of the spreadsheet you can display at one time, the better. The number of lines and columns displayed doesn't affect the total size of the spreadsheet, since the screen just acts like a window on the overall spreadsheet, but the more spreadsheet you can see at any one time, the easier it is to work with.

Transportable portables generally offer the usual 24 lines of 80 characters, which is the maximum you will normally expect to see. The smaller briefcase and notebook computers display a much-reduced area of the spreadsheet (except for the GRiD Compass). Clever programming makes it possible to use these computers—and even a hand-held computer—with a spreadsheet. But it's harder—a lot harder. Again, higher portability must be an important consideration to compensate for this inconvenience.

The second consideration is the size of the monitor. The larger the screen, the easier all those numbers will be on your eyes. Transportables have 5-inch (Osborne 1), 7-inch (Osborne Executive, Hyperion, Jonos), or 9-inch (everybody else) screens. Nine-inch is pretty good, but consider getting a 12- or even 14-inch external monitor for those long days you spend slaving over a hot spreadsheet.

A third consideration is your printer. You may want one with a wide carriage to print bigger spreadsheets. An alternative is a printer that can print "compressed" (15, 16, or 17 characters per inch) type and fit about 132 characters on an ordinary 81/2-inch-wide page. Most dot-matrix printers can handle compressed print, and many daisy printers can,

too. There are also programs available to print vertically on standard width printers.

Finally, more RAM space can be important to people who use very large spreadsheets on a daily basis. With the exception of Perfect Calc, spreadsheet programs operate entirely in RAM for the sake of speed of operation. This means the more RAM memory you have, the bigger spreadsheet you can make (in theory: in fact, the program has to be set up to take advantage of this extra memory). A typical 64K portable will give you a spreadsheet of roughly 50 rows and 25 columns (it varies widely with the data being used). Go to a 128K machine and you don't merely double that figure, you increase it fourfold or more (because operational overhead—the amount of RAM the program itself takes—remains about the same). That is one of the principal driving forces behind increased RAM size in micros recently.

(Note: if your calc program is the reason you want increased RAM, you're better off getting a 16-bit computer since it uses the extra RAM directly. An 8-bit computer expanded to 128K uses bank switching, and the extra programming overhead reduces the effective yield of this extra memory.)

There is little difference in availability of large memories between the transportables and their desktop equivalents. Most of the IBM compatibles can expand to 256K or 512K, and the 8-bit CP/M computers are limited to 64K RAM. Briefcase and notebook computers frequently have more limited RAM.

File Management and Accounting

What Is a Data Base Management System (DBMS)?

A data base is a computer version of a filing cabinet. Once upon a time, in the bad old giant computer days, computers kept records the way your filing cabinet kept them: different information in different drawers and different folders, with a lot of duplication of information from drawer to drawer. Then it occurred to somebody to keep all the information in one giant "file" and let the computer figure out where things

were when they were needed. After all, the computer is fast and efficient: let *it* keep track of things.

This was the origin of the "data base," which is like one giant filing cabinet drawer. Actually, it's like having your files cross-indexed to some undreamt-of extreme, so you never have to enter the same piece of information twice. The computer just cross-indexes all the appropriate files so it can find the information when it needs to.

With a data base program, you change the address of a client and the computer makes sure that change is registered not only on your client mailing list, but also on the accounts receivable list, on the accounts payable list if the client is also a vendor, and anywhere else in the data base that addresses are kept. You need enter information only once: the computer makes sure it ends up everywhere it belongs.

Back to the bad old days: one of the disadvantages of having the giant computer keep your records was that if anything ever changed, you had to reprogram the computer and even re-enter all the records, or at least convert them over to the new file system. (When they decided to add a few more digits to the zip code, the cries of anguish at the banks which programmed their records in COBOL were piteous to hear.)

That was another problem the data base concept solved. You can usually add another field to the data base. You can always delete a field, and the data base will adjust quickly. And anytime you need a new report, just sketch it out on the machine and the computer will take care of things. Some changes are still a little awkward to make even with data bases, but nothing like they were in the past.

Data base programs like dBase II, Condor and MDBS are awesome, elaborate, and enormously powerful, yet less difficult to master than a true programming language like BASIC. Even simpler are the file management programs like Personal Pearl, Perfect Filer, and T.I.M., which are more limited-purpose file management programs.

How It Works

How do data base programs work? A program like dBase II starts off with a screen that asks you for basic information about the material you're keeping in the data base, as shown

in Sample One. The words in capital letters are presented by the program; the words in small letters are what you type on the screen.

SAMPLE ONE: DBASE II DATABASE CREATION

```
 .create
ENTER FILENAME:names
ENTER RECORD STRUCTURE AS FOLLOWS:
      NAME,TYPE,WIDTH,
  FIELD DECIMAL PLACES
  001    name,c,20
  002    address,c,25
  003    city,c,20
  004    state,c,2
  005    zip:code,c,5
  006    <RETURN>
```

The user manual explains what it all means, of course, but you can see at a glance that you're telling the program what information will go in this name-and-address file and how many characters to reserve for each field: 20 spaces for the name, 25 for the address, and so on.

When you're done (and press <RETURN>), dBase II files this data base information away, then is ready to take data. It shows you what you see in Sample Two, and you type information in the blanks. The space between the colons is the amount of space you have to type in the information.

SAMPLE TWO: ENTERING DATA

```
RECORD #00001
NAME       :                                   :
ADDRESS    :                                         :
CITY       :                                   :
STATE      :   :
ZIP:CODE   :       :
```

The program files away all this information. You can go back later and make corrections on the data. And you can add new lines to the form.

A data base is good primarily for what it can produce

after you've entered the data. With certain commands like *List*, you can print a list of all the names and addresses, or select certain ones, say, by zip code, or in reverse alphabetical order, or by city. This is where the power of the data base lies: in being able to select the information you want displayed or printed. Imagine being able to select out only subscribers ready for renewal, or only a certain zip code for a sale flyer!

You can also have the program add up certain fields and report the totals or display selected information in any format—all in one line or organized for printing on labels. You can pick out just the names and addresses, or include the amounts due or other information, at your command. It's this flexibility that makes the data base such an exciting concept.

Full-fledged relational data base systems can be complicated. When all you need is to organize your files in some basic way, you want a simpler file management program. These provide much of the power of the full data base system to input, sort, and print reports, but are easier to use.

For example, instead of asking you to list the entry items, Personal Pearl just presents you with a blank screen. You then type on the screen what you want to appear on the data base input file, using underlines to indicate where the information goes on the screen, as shown in Sample Three.

SAMPLE THREE: PERSONAL PEARL REPORT FORM

```
Name: _____________________________

Address: _____________________________________

City: _____________ State: __  Zip: _____
```

Then you can create "reports" in the same way: just type on the screen exactly what information you want to see printed, and where on the page it should appear, using the screen as if it were a report page.

When you've shown the program where the information should go on the printout, the program prints the report. As

with a data base manager, you can use a file manager to select certain zip codes or names, and put them in alphabetical order by name or by city, or in numerical order by zip code for ease of sorting. You can produce mailing labels or business reports.

A file manager is more limited than a data base system (and cheaper: $150 compared to $500 or more). A data base system can present predefined screens to the data entry clerk, check for errors and display customized error messages, and run the entire input-output operation automatically. The data base system can produce more elaborately sorted and digested reports. You can even produce an elaborate, full-function accounting package with a data base manager—but not with a file manager.

A file manager, on the other hand, simply keeps track of your files, sorts and organizes them, and prints any kind of straightforward report you want. The trade-off, as usual, is ease of use and cost versus power. Most people can handle a file manager; a sophisticated data base program takes some programming experience if you expect to get full value.

When looking at file and data base systems, check the following:

- How many records will you have? Each system has limits on how many records it can handle.
- How many items and characters will be in each record? Check that against the program's capacity.
- How much time will you spend inputting and updating? Data base programs have more elaborate provisions for interactive displays and fancy error-checking than file management programs do.
- Do you need to interact with other programs such as word processors or spreadsheets? List the exact brand names of the programs required, and check which file or data base managers can use data from these programs.
- Do you need additional programs to use the file manager effectively? Some programs like DataStar will design input forms and take data, but when you want to

sort or output reports, you need additional programs (SuperSort and ReportStar).

Business Accounting

Keeping track of business accounts is an important application for many computer owners, including those who have portables. All the traditional accounting areas—receivables, payables, general ledger, payroll, inventory—can be maintained on a full-sized portable. Separate programs apply to each area, with a consolidation program to carry over totals relevant to each program.

Only one of the portables reviewed here includes free accounting software (the Star-Lite transportable). If you set out to buy accounting programs, here are some tried-and-true business tips:

1. Find the package that's right for your business. Ask other people in the same kind of business what they use. Ask people in businesses that keep books the same way you do (even if the business itself is different). Check your local or national business or industry association: many keep lists of effective business software for their field. Ask your accountant. He or she will have to work with the results sooner or later, so be sure to involve the accountant before you buy. Besides, they may know somebody who's already installed software and can advise you. If you already have the computer, check with the manufacturer: some maintain lists of vendors with programs that run on their machines.

2. Fill a file folder with samples of your accounting work—every input form and output report you use, need, or wish you had. Count the number of inventory items you have, the number of accounts, the number of everything. Make a list of everything you'd like to see the package do. Now check with your software vendor or consultant, or look at the user manual for the product you're considering. The manual will show sample reports. Check the reports line by line. Do they show all the information you need? Pick the package with reports closest to your ideal. Don't take the salesman's word that a specific report or reporting

detail is produced: see it on the printout or read it in the user manual.

If the vendor or consultant provides references of satisfied users, go ahead and contact them. They sometimes surprise you by being honest. Test drive the program if at all possible. PS: If you can't understand the user manual in the store, you won't be able to understand it back at the office.

3. If yours is a reasonably small operation, adjust your business to the software, not the other way around. Using prepackaged software is usually more time efficient and economical than hiring a programmer to write software for you. Finding an accounting package that matches your unique method of operation is usually difficult. Hiring somebody to program for you will be costly and may take from six months to one year, with no guarantee that the result will function properly.

Besides, if you adjust your bookkeeping to conform to a standard accounting package, such as Accounting Peachtree, your business will probably thrive from being organized in a more conventional and proven way. And you'll find it easier to get a loan, find investors, or sell the business when you use standardized paperwork.

4. Buy the program you need the most first. If you need accounts receivable, get that module first, set it up, and get it started. Don't try to computerize your entire accounting operation in one fell swoop. It's just too much work and if something goes wrong, it goes wrong big. When you've mastered your accounts receivable, then plug in your general ledger or inventory or whatever is next most vital on your list.

Hardware Considerations

File management and accounting systems make great demands, mainly on mass storage. An ordinary 183K dual disk drive system can handle files of several hundred names and addresses without difficulty. Larger disk capacity can handle larger files. If your files are too long to fit all on one disk, you can break the files up into logical groupings: A-F, G-K, and so on. This means you won't be able to produce reports

that combine information from separate disks, but you'll put off investing in a hard disk or a larger disk drive.

For truly large files, you'll need a hard disk, which has the added advantage of speeding up the sorting process. To sort a name-and-address list of two hundred people in alphabetical order can take one or two minutes with Personal Pearl or dBase II using a 183K-capacity floppy disk drive, which isn't that long because the entire list will fit into a 64K RAM, where sorting is much faster. But when you get thousands of names, and the computer has to sort a few at a time, then swap them on the disk, things slow down tremendously. That's when you need a hard disk. (More RAM will also speed up sorting time, but not as dramatically as a hard disk if your files are truly large.)

On the other hand, if your files are small but you do lots of elaborate sorting in RAM, then one or two minutes per sort can become a problem. Here there are several solutions:

- Buy a specialty sorting program designed to speed things up: SuperSort for DataStar, or DBPlus for dBase II.
- Start out with a program like InfoStar, which includes its own specialty sorting program, SuperSort.
- Use a faster, 16-bit computer.

The Portable Difference

For most people, any transportable computer can handle everyday file management requirements easily. If you have lengthy files, watch for portables with larger capacity disk drives, the double-sided 320K or 400K drives, for example. And be sure to use only dual-drive computers to minimize space taken up on the data disk by programming materials. Larger RAM than the basic 64K can also help.

Briefcase and notebook computers, on the other hand, are limited in RAM size and storage capacity, and so are more appropriate for limited cardbox-type lists like telephone numbers or short name-and-address lists.

For accounting, a full-sized transportable computer can handle as much accounting as any comparable desktop version, and with the same limitations. Accounting makes few demands on the CPU, but if it gets elaborate enough you may

need a hard disk to hold all the data. You could use a data base or file management system to write your own accounting system, but if you have an operator spending a week or two each month handling the accounts, that's probably large enough an operation to justify a full-fledged ($500 or more per unit) prewritten accounting system.

A briefcase or notebook computer cannot function as an accounting computer, but may serve as a remote entry point for entering accounting data—sales information or inventory data, for example. Then you can take the data back to the main office and dump it into the regular transportable or desktop computer. Make sure the two computers are capable of transferring data, and that the software on both computers is compatible.

Personal Productivity

Some Examples

Personal productivity means using the microcomputer in your personal daily work: the reports you write, the data you obtain and generate, the schedules you keep. Personal productivity software includes checkbook and home accounting programs, personal filing, personal addresses and telephone numbers, taxes, calendars and appointment lists, client tickler lists, and scheduling programs. For people doing specific kinds of work, personal productivity software can include statistical packages, engineering programs, advanced mathematical operations, or indexing, spelling, and footnoting programs for writers.

Let's review some examples.

The Otrona Attache comes with a program that keeps schedules for you, interrupts whatever you are doing on the computer, and reminds you of your appointments. The Radio Shack Model 100 keeps name-and-address lists, and remembers all the numbers you need to sign-on to information utilities such as The Source or CompuServe, and sends them out all at a single keystroke. Few other personal productivity programs are bundled-in with portable computers, but others are popular as after-sale purchases.

Business projections are aided by PERT/Gantt chart programs such as Milestone, which set up and maintain a sched-

ule for a complex job—keeping track of timing, critical path jobs, cash flow, and manpower requirements day-to-day—then provide written reports by manpower category, cash flow, or a full PERT chart printout. Other programs provide jobs-in-progress schedules, bid calculations, and engineering calculations.

Several "index card programs," such as Caxton's Cardbox, are simplified file managers that display an index card on the screen (complete with lines, like a real index card). Type in the information just as if it were an index card, and the computer will file it away, then fetch any card or combination of cards desired. These quick and simple programs are unsophisticated compared to full file management programs, but they profit from ease of use and quick access.

Any number of personal money management programs exist, including home accounting programs, taxpayer programs that prepare your personal income taxes (with data updated by the manufacturer according to each year's tax law changes), and a long list of stock market programs to plot Wall Street fluctuations, portfolio programs to count your cash, and real estate programs to help determine investment strategy.

Most of the above programs are more readily available on transportable computers, which offer a wider variety of more powerful programs, than on notebook and briefcase computers.

Educational programs are in shorter supply on CP/M than on MS-DOS computers mainly because MS-DOS can display color. But even CP/M can provide a healthy selection of language tutorials, spelling, and math drills for all ages, and even teach typing to adult computer users. (Learn to type and you'll transform your entire computer experience.) Colorful educational programs are migrating over to the IBM-compatible portable market from the Apple world.

Let us not forget games: Mychess is a chess program that will handily whip most amateur players; Othello, bridge, poker, and blackjack are available (the latter two are also generally available on notebook computers). More traditional games are Space Invaders, Star Trek, and Eliza, the computer therapist. And don't overlook Zork, the upgraded word adventure game that takes you to an underground cavern, or Deadline, where you are a detective who must find

out who murdered the millionaire (but watch out—you could get shot yourself). These latter two are all-prose games, best described as interactive fiction.

IBM-like portables also have access to a list of arcade-style games, plus the most popular IBM game of all, Flight Simulator, which puts you at the controls of an airplane ready to take off from small airfields outside major U.S. cities.

In sum, many people buy a computer to put their accounts on, then find the computer most valuable as a personal aide—filing memos, producing perfectly-typed copy, remembering events, maintaining a schedule, and calculating rates of return, standard deviation, or net present value.

The Portable Difference

There is little difference between the transportable and any desktop computer in running most personal productivity software. Limitations on briefcase and notebook computers depend on the software. Limited mass storage and smaller displays are the most common problem areas.

Telecommunications

A modem is a small electronic device that connects your computer to the telephone line so it can talk to other computers by phone. You'd want to do this so you could trade information with a friend or business associate, access large commercial data bases, or transfer data between otherwise incompatible computers.

Examples of On-line Data Bases

You can't put all the information you need in your own computer. You haven't got the time (even if you had the storage capacity), and in many cases you don't have access to the necessary information. Commercial data bases put business information on large computers and charge you by the minute to access it.

The Source and CompuServe are two general-purpose data bases that provide the UPI wire service, catalog shop-

ping, airline schedules, financial news, an encyclopedia, and some games. You can also send electronic mail and receive mail from others. This is a handy way of transferring text files between incompatible computers.

Dow Jones runs a data base containing a month's worth of the *Wall Street Journal*, a year of *Barron's*, and the scripts to "Wall Street Week," which you can search by subject or name. Dow Jones historical information is available, as well as the New York Stock Exchange wire (with only the statutory fifteen-minute delay), corporate information on file with the Securities and Exchange Commission (SEC), money market quotes, corporate earnings estimates, and even movie reviews, sports, weather, another encyclopedia, and, of course, an order-by-computer catalog store.

Dialog is one of the largest public-access data bases around. It consists of abstracts from virtually every kind of scientific, medical, and engineering publication in the world. Tens of thousands of publications are indexed, with reprints available. A general publications index is also maintained.

NewsNet provides the complete text of some one hundred newsletters—the kind of specialty publications that charge $100 a year or more for a subscription, with titles like *Electric Vehicle Progress, Sludge Newsletter, Daily Petro Futures,* and *Brazil Regional Report.* Not famous names to you, perhaps, but vital if you're into power, waste disposal, petroleum futures, or the Brazilian economy.

Other newsletters provide literature searches of every conceivable kind: patent searches, legal and political references, the Department of Energy research data base, the *New York Times* and many other city newspapers, and even lists of jobs available in certain areas. What was once done only in specialized libraries is now available, in seconds, to anyone with a computer and modem.

These data bases cost anywhere from $5 to $125 per hour to use. With experience, you can perform a search in fifteen minutes or less. Some data bases require a setup fee; others have a minimum monthly fee.

Talking to Other Microcomputers

Two micros that each have modems and modem software can communicate with one another by telephone. If the com-

puters are identical or compatible, they can trade any kind of files that might be on the disk of one or the other. If the computers are different kinds, they can't trade programs, but they can at least trade word processing, data base, and spreadsheet data files. This book was written on a dozen mutually incompatible portables, then consolidated on one computer via modem for final editing, at the cost of a few telephone calls.

When it comes to text, it doesn't matter what kind of computer or what kind of word processing program you have: the modem can handle them all. Programs are another thing. Whether a modem can handle them depends on the kind of terminal, chip, and operating system being used.

Hardware Considerations

Telecommunications make no particular demands on the hardware. If you're sending and receiving a lot of information, more RAM and more disk storage is nice, but not vital (it would take a lot of sending and receiving to fill up a disk).

Most computers will take a modem, plugged into the serial (RS-232C) interface. You also need communications software to run the modem. Some is available free from user groups or "electronic bulletin boards" (nonprofit hobbyist communications networks). Modems cost from about $60 for a 300 baud modem ("baud" measures how fast the modem sends and receives information) to $500 for a 1200 baud modem. Most people have 300 baud modems. Software costs anywhere from nothing (for "freeware") to about $100.

The Portable Difference

Portables shine in telecommunications, suffering from no particular handicaps and in some cases enjoying some advantages. The Radio Shack Model 100, for example, has a built-in modem with complete software included in the price, and operates with a minimum of keystrokes. Many people buy notebook or briefcase computers primarily for telecommunications, since they can carry the computers with them on business trips and access their electronic mailboxes, the stock market, or research data whenever they want.

Programming Languages

Do I Need to Learn Programming?

If you worry that you'll have to learn programming to make effective use of your portable microcomputer—stop worrying. You don't need to program anything, unless you have unusual requirements. There's a tremendous selection of prewritten, off-the-shelf programs available for most portables.

Why, then, do so many portables include a programming language or two as part of the software package? The most common bundled programming language is MBASIC, a common form of business BASIC. This is included not because you're expected to learn how to program—programming is difficult, complex, and time-consuming—but so you can run programs that have already been written in BASIC by other people.

There are two common kinds of programs: those which can run by themselves, and those written in BASIC which need to have BASIC loaded into the memory before they work. And there are lots of business programs written in BASIC that have been tested and proven effective. Including BASIC with your computer is intended by the manufacturer as a convenience; you'd have to buy BASIC anyway to run many available programs.

Summary

Requirements of Applications

The following list summarizes the optimum hardware and software considerations for each of the preceding applications. The more important a given application is to you, the more consideration you should give to the requirements in that category.

Word Processing The most important hardware features for word processing are: a good keyboard with several function keys; a good display; fast, high-quality printing; and two disk drives of good storage capacity. A serial port should be available for connecting a daisy-wheel printer, and/or a parallel port for connecting a dot-matrix printer. Word processing software should be powerful and should be able to access

many special printer features from a wide range of printers. Casual users of word processing, who will write brief documents, can get away with smaller displays, fewer editing/formatting features, less storage, and a slower or lower-quality printer. The most important feature of the word processing software for the casual user is probably ease of use.

Spreadsheets The most important hardware features for the heavy spreadsheet user are: a 10-key numeric keypad; a large, clear display capable of displaying as many columns as possible (may require an external monitor); and a printer with compressed print (15- to 17-character-per-inch) capabilities. Spreadsheet software should be flexible and powerful, error-free, and fast. For highly complex spreadsheet use, a more powerful 16-bit chip (8088 or 8086) or the ability to add on an 8087 arithmetic coprocessor for mathematically complex operations may be a bonus.

More casual users can sacrifice the size of the display—perhaps trading overall display dimensions for size and clarity of individual numbers—and will make no particular demands on the computer chip, the printer, or the software. Ease of use and clear program commands are more important than raw power.

File Management and Accounting The most important hardware factor for heavy file management and accounting—especially if the data base is large and/or will be heavily used (daily or weekly)—is large disk capacity. A hard disk might be considered, especially for overall speed improvement. (You might buy the computer first and add a hard disk later, as the need for it becomes obvious.) A numeric keypad is also a benefit. Very large accounting requirements may make it worthwhile to consider faster 16-bit computer chips, or a portable able to add a high-speed 8087 coprocessor.

Software must be powerful, and able to produce all the reports you require. If clerks will be doing data entry, programs should be entirely menu-driven (self-explanatory) and with extensive error-catching and lots of data safety features. You may have to adapt your accounting style to that of the software, which may require expensive but rewarding analysis of your operations. Considerable effort may be required to learn and make full use of all the powers of your data base system.

One- or two-person businesses, or those requiring more casual maintenance of everyday files, can create their own filing and accounting systems with file management programs, and will find standard hardware and disk capacity sufficient. The principal need in this instance is for software that is easy to use and easy to adapt as you learn.

Telecommunications Intensive users of telecommunications should consider a higher-speed, 1200 baud modem at a cost of about $500 (the standard modem is rated at 300 baud and costs as little as $60). For those who need constant access to telecommunications while traveling, a built-in modem is very convenient. The modem should be capable of auto-answer; auto-dial is valuable if you wish the computer to dial automatically and send/receive data while you are away (to take advantage of night rates or time zone differences). Software should be easy to use, should provide a wide range of protocols so it can respond to different kinds of computers, and should be able to send and receive multiple files.

Casual telecommunications users can get by with as little as the cheapest modem on the market and "freeware" modem software (programs that are provided free by user groups and hobbyist electronic bulletin boards).

Personal Productivity The most valued hardware consideration in personal productivity is overall convenience. Weight is important if you travel a lot with the computer. Availability of a wide range of personal business software tools, like schedulers and statistical packages, is also a plus. The amount of space taken up on the desk may be important if the computer must be by your side at all times. Convenient, appealing, easy-to-use software that fits in naturally with your workday is most important.

Programming An ordinary 64K RAM transportable is a very powerful machine for creating one's own programs in BASIC or Pascal or other programming languages created with the microcomputer in mind. Even briefcase and notebook computers can perform quite elaborate customized programming tricks for those interested in developing their own routines. As teaching machines, the portables are unsurpassed. Mainframe-oriented languages such as COBOL and Ada are also available on transportable computers.

Chapter Five

Four Steps to a Successful Purchase

Now that you've learned what portable computers do and how they work, it's time to get specific about what sort of portable computer is right for you. While we evaluate every portable microcomputer in production or announced at the time of this writing, there will be a few more new computers on the market by the time you read this. We can't review machines that aren't out yet, but we can do something even better: we can arm you with a point of view, so you can evaluate both our reviews and the new machines like a pro.

This chapter guides you to the right computer in four steps:

- First, determine your needs.
- Second, find out which computers are best for those needs.
- Third, find out where to shop for your computer.
- And fourth, learn some tips for making the purchase.

Step One: The Needs Analysis Questionnaire: "What Will It Do for Me?"

A computer is a complex purchase. The many options available and the possible trade-offs in money, power, and time can seem overwhelming. It's easy to spend more than you need just because you haven't performed a realistic appraisal of your computer needs.

The time you spend on the Needs Analysis Questionnaire in this section will save you time later by letting you zero in on the handful of computers most likely to fill your computing needs. At the very least, you'll be able to narrow your choices to one basic category: transportable, briefcase, or notebook.

As you go through the questionnaire, spend some time thinking about your present and future needs. At the end of the questionnaire, you should have a list of your primary computer needs, in order of priority. This will enable you to make intelligent decisions about trade-offs.

The Needs Analysis Questionnaire is divided into three sections:

- *what* you want to do,
- *how* you want to do it, and
- *where* you want to do it.

How much you're prepared to pay is not considered at this point, because it can safely be left until after you've narrowed your search down to specific machines. You'll be surprised at the range of price choices you'll have in every category.

First, go through the list in each section, checking off those areas that seem most appropriate. Then, summarize your needs in the order in which you consider them most important to you. This will give you a hierarchically ordered list of your needs in software, power, ease of use, and portability, which you can then apply to the hardware listings that follow.

Ready?

WHAT WILL I BE DOING?

We've divided computer function into the six basic applications that account for eighty percent of portable computer use. Consider each category carefully, bearing in mind the things you think you want to do with your computer. Check off the appropriate selections. (Detailed descriptions of each application may be found in Chapter Four.)

Word Processing

Its importance depends on how often you'll be using the word processing capabilities of your computer, and the length of the documents you expect to create. *Casual* word processing means you'll be using the computer mostly to generate notes, letters of two pages or less, and lists. These don't require extensive formatting or storage capabilities. Heavy word processing means you'll be writing lengthy documents, reports, indexes, magazine articles, and other, more formal items that will require extensive formatting, indexing, printing, and storage capabilities.

Casual _____ **Heavy** _____

Spreadsheeting

Casual use means you have a limited need for spreadsheeting capabilities. *Heavy* use means a frequent need to generate long, complex, interrelated spreadsheets.

Casual _____ **Heavy** _____

File Management and Business Accounting

Needs in this area depend on the amount of data you'll be managing, and the amount of storage you'll need.

Low-level file management means maintaining, sorting, and searching fairly small groups of data containing a few hundred records that will be manipulated in fairly straightforward ways: a mailing list, client list, personal address list, telephone number list, or small inventory (a thousand short items) as kept by a small business office. These files don't require heavy manipulations or sorts, speed of access isn't important, and a file management program or off-the-shelf business package will suffice.

High-level data base management is defined as maintaining, sorting, and searching through large groups of data containing large records, such as lengthy patient or client records, heavy use of invoices, extensive vendor lists, large mailing lists, elaborate inventories, or data bases requiring elaborate and sophisticated manipulation. These data bases demand lots of disk storage and high speed access, as well as a powerful data base management program.

Low-level _____ **High-level** _____

Personal Productivity

This is a catchall for daily use: personal records such as telephone numbers, appointments, job scheduling; and personal calculating functions such as loan amortization, value of investments, and engineering functions.

Casual _____ **Heavy** _____

Telecommunications

Brief communications are mostly short exchanges of information (transferring files or messages either from your portable to another computer or information utility, or vice versa). *Lengthy* communications involve extensive or time-consuming searching through data bases or manipulating data online, or involved interaction with in-house minicomputers or mainframes.

Brief _____ **Lengthy** _____

Programming

Simple programming is defined as programming in BASIC or tutorial-level use of languages such as Pascal, Logo, Fortran, C, and Forth. *Advanced* programming involves serious programming in compiled languages such as Pascal, Forth, COBOL, and assembly language, as well as BASIC programs containing hundreds of lines of code. These applications benefit from extensive storage capabilities and processor power.

Simple _____ **Advanced** _____

HOW WILL I DO IT?

This section asks you to select features of computers or computing that affect the way you perform the applications in Step One. In other words, once you've decided WHAT you want to do, you need to think about HOW you want to do it. Again, check off the features that are important to you.

Software

Software is what makes the computer do what you want it to do. Can you be happy with the manufacturer-supplied software? Or is it important to you to have access to a wide array of software as your needs develop in the future?

Software Availability _____

Ease of Use

If you're an experienced computer user, ease of use is less important than raw power. But if you are a novice, ease of use can make the difference between successful computing and complete frustration.

Sad to say, ease of use seems to be inversely proportional to the flexibility of the computer: the easier it is to use, the fewer choices you have in the way you use it (that's how they make it easy to use). Are you willing to spend some time learning the computer, (and, having learned it, some more time to use it), or is it particularly important that the computer be easy to use and easy to operate?

Ease of Use _____

Compatibility

Is it important that the computer be able to share disks and data with other computers? If you have a computer at the office and want to use its disks on your portable, you'll need a compatible portable. If you own only one computer and use it exclusively, this is a less important issue.

Compatibility _____

WHERE WILL I DO IT?

In this section you'll decide the separate issue of how important mobility and portability are in your choice of a portable.

Portability

Portable indicates that you need maximum mobility for your computer because you'll be traveling frequently. Electric power cannot be assumed, and therefore your dominant needs are for small size, lightness, an internal power supply, and non-volatile storage. *Transportable* indicates you'll want to be able to move your computer around, but that it will mostly stay in one place, where electric power can be assumed.

Portable _____ **Transportable** _____

SUMMARY OF NEEDS PRIORITIES

Now that you've filled out the Needs Analysis Questionnaire, transfer your findings to this convenient chart. Then number your choices in order of importance in each category (What, How, and Where). This will give you an ordered list vital for Step Two.

1. WHAT:

a. Word Processing
Casual _____ **Heavy** _____

b. Spreadsheeting
Casual _____ **Heavy** _____

c. File Management and Accounting
Low-level _____ **High-level** _____

d. Personal Productivity
Casual _____ **Heavy** _____

e. Telecommunications
Brief _____ **Lengthy** _____

f. Programming
Simple _____ **Advanced** _____

2. HOW:
- a. Software Availability _____
- b. Ease of Use _____
- c. Compatibility with other computers _____

3. WHERE:
- a. Portable _____
- b. Transportable _____

Now that you've finished the Needs Analysis Questionnaire, you've eliminated categories that are less important. This will allow you to concentrate your efforts on computers that fulfill your requirements in the remaining categories. When contradictions or trade-offs arise, a thorough analysis will further eliminate many contenders.

Step Two: Which Computer Fits You? The Optimum Configurations Charts

In the optimum configurations charts that follow, we've summarized our ratings of the computers we review in Chapter 6. The computers are grouped as Portables (the notebook and briefcase computers) and Transportables.

Factors weighed (and explained in the reviews) include: bundled software; additional available software; display size; ease of use; and disk capacity, where relevant (data base management). An asterisk on the chart indicates a special suitability or ease of use.

Applications are the most important factor in selection, so in using the optimum configurations charts, first list the computers that fit your top three priorities as determined in Section 1 (WHAT) of the Needs Analysis Questionnaire. Then narrow down the field by applying the two highest priority choices from Section 2 (HOW). This process should reduce the field to a handful of computers that require your serious, detailed consideration.

WORD PROCESSING[1]

Casual	Heavy
Transportables	
Actrix	Attache
Hyperion	Chameleon
Pied Piper	Columbia
Sord	Compaq
Star-Lite	Corona
	Jonos
	Kaypro[2]
	Macintosh
	Voyager
Portables	
Epson	
Gavilan*	
GRiD*	
Model 100	
NEC	
Teleram	

*Indicates special suitability.
[1]Based on bundled software.
[2]With WordStar.

SPREADSHEETING[1]

Casual	Heavy
Transportables	
Actrix	Chameleon
Attache[2]	Columbia
Hyperion	Compaq
Kaypro	Corona
Pied Piper	Jonos
Star-Lite	Macintosh
	Voyager
Portables	
Gavilan*	GRiD*
Teleram	

*Indicates special suitability.
[1]Based on bundled software.
[2]Heavy with large external monitor.

DATA BASE MANAGEMENT

Low-level	High-level
Transportables	
Actrix	Chameleon
Attache[1]	Columbia
Kaypro[2]	Compaq
Macintosh	Corona
Pied Piper	Hyperion
Sord	Jonos
	Star-Lite
	Voyager
Portables	
Gavilan*	
GRiD*	
Model 100	
NEC	
Teleram	

*Indicates special suitability.
[1]High-level with external monitor.
[2]High-level with larger disk models.

PROGRAMMING

Simple	Advanced
Transportables	
Actrix	Chameleon
Attache	Columbia
Hyperion*	Compaq
Pied Piper	Corona
Sord	Jonos*
	Kaypro
	Macintosh
	Star-Lite*
	Voyager*
Portables	
Epson	GRiD
Model 100*	
NEC*	
Teleram	

*Indicates special suitability.

TELECOMMUNICATIONS

Brief	Lengthy
Transportables	
Attache[1]	Actrix*
Sord	Chameleon
	Columbia
	Compaq
	Corona
	Hyperion*
	Jonos
	Kaypro
	Macintosh
	Pied Piper
	Star-Lite
	Voyager
Portables	
Epson	Gavilan
Model 100*	GRiD*
Nec	
Teleram*	

*Indicates especially useful features.
[1]Lengthy if used with external monitor.

SOFTWARE AVAILABILITY

Poor	Fair	Good	Excellent
Transportables			
Sord	Hyperion	Chameleon	Actrix
	Macintosh		Attache
	Pied Piper		Columbia
			Compaq
			Corona
			Jonos
			Kaypro
			Star-Lite
			Voyager
Portables			
Epson	GRiD		Gavilan
	NEC		Teleram
	Model 100		

PERSONAL PRODUCTIVITY

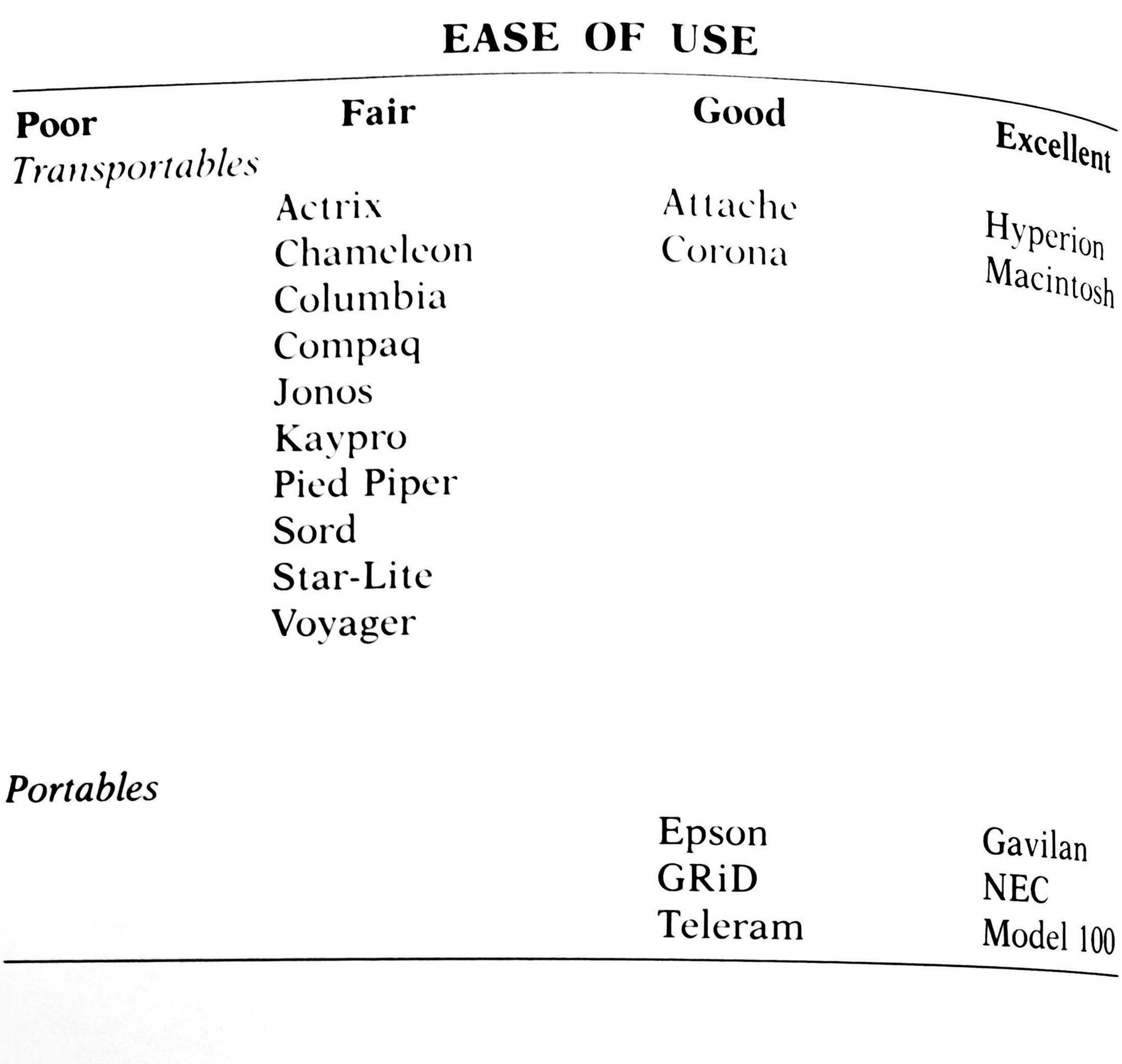
Casual	Heavy
Transportables	
Pied Piper	Actrix
Sord	Attache*
	Chameleon
	Columbia
	Compaq
	Corona
	Hyperion*
	Jonos
	Kaypro
	Macintosh
	Star-Lite
	Voyager
Portables	
Epson	
Gavilan*	
GRiD*	
Model 100	
NEC	
Teleram	

*Indicates especially useful features.

COMPATIBILITY

Poor	Fair	Good	Excellent
Transportables			
Macintosh	Hyperion	Actrix	Compaq*
Pied Piper		Attache	Corona
Sord		Chameleon	Jonos
		Columbia	Star-Lite*
		Kaypro	Voyager
Portables			
Epson	GRiD		
NEC	Gavilan		
Model 100	Teleram		

*Indicates greatest compatibility.



Step Three: Where to Buy a Portable

Once you've narrowed your field of choices to a few specific computers, it's time to go out and look at them. The question is, where?

It seems like everybody's getting into the computer business these days: department stores, mass merchandisers, mail order houses, chain stores, and of course independent retailers. Let's take a look at these outlets, one at a time.

Department Stores

Many large department store chains are making varying commitments to the retailing of computers, from opening entire new departments staffed with fairly knowledgeable computer salespeople, to merely extending the inventory of their radio and television areas by adding a few home computers. The most noteworthy investment in computer re-

tailing by a large chain is the Sears Computer Centers, which carry a large assortment of computers in all price ranges.

You should be able to tell fairly quickly what sort of salespeople staff a department by their responses to your questions. Assuming you've found a place with knowledgeable sales help, there are several drawbacks to shopping in department stores.

Browsers Because the computers are in a department store, there will be a constant stream of window-shoppers tying up the salespeople with general questions about what computers are and what they cost and how you plug them in. Computers are a great source of curiosity, and the computer department's limited sales staff will be hard put to deal with the streams of browsers and adolescents test-driving the latest computer games, let alone to serve the serious shopper.

Selection Department store computer centers suffer from the same equipment prejudices as other outlets, only the chances are they'll offer a much smaller selection.

Service For department stores, providing support for the computer user means answering hardware and software questions. Most department stores don't offer service on-site, so there's no one who has the technical knowledge you need for really decent support. When you have a problem, you might well be directed to a service center, where they're so busy fixing computers they don't have time to answer a lot of questions.

Pricing One of the great hopes of department stores in entering the computer retailing business is that the old revolving charge account that lets you pay for the equipment in easy monthly installments will bring in a lot of buyers, since it's been hard for computer stores to offer time payments. But computer financing is becoming more widely available, so this advantage is slipping. The trade-off, when you yield to the temptation to buy on easy credit terms, is the department store's almost total inability to bargain with you for a discount. This is balanced, however, by the chain's ability to buy large quantities and thus to offer some good deals from the outset.

Personnel No matter how diligently a department store tries to staff its store with computer sales experts, they're highly unlikely to attract the same caliber of personnel as an in-

dependent or chain computer retailer. One reason is that the atmosphere just isn't the same: a dyed-in-the-wool computer salesperson won't be too comfortable sandwiched between the cameras and the stereo equipment. Another reason is that department stores usually look first for people with department store experience, and only secondarily for people with specific experience in the product they're selling.

Mass Merchandisers

Fortunately, mass merchandisers have only invaded the lowest rungs of computer retailing, and that pretty much rules out their carrying most of the portable computers. As prices drop and competition heats up, however, you can expect to see some portables at places like K-Mart, especially if the computer maker has previous experience in mass-market merchandising (as Commodore does).

Price This is the only advantage in buying from a mass merchandiser. They buy in such trainload quantities that you're almost certain to get the best deal from them. In fact, most mass merchandisers now sell home computer goods to the public for less than independent stores can buy them wholesale. While taking advantage of this state of affairs with a computer—especially for a beginning computer user—for reasons defined below.

Support This doesn't exist at mass merchandisers. The salespeople don't know anything about the products, and they don't have the time (or room) to sit down with you and iron out a problem or give you serious advice. For the same reasons, service will certainly be handled by a third-party service organization.

Training Training at the store won't exist: again, no place to have it, no time to give it, nobody expert enough to offer it, and at these prices there's no profit margin to support it.

In sum, you get price, you give up support.

Mail-order Houses

Price is the key attraction here. These places are fine for buying accessories or supplies for your computer once you've figured out the computer, but not for buying the computer itself. The prices are great, but again, no *training*, no *service*

and very little *support*. Our advice to the beginning computerist is: Don't buy major equipment or important software mail order; it's worth some extra cash to have a local source of support.

A further pitfall is lack of integrity. There are several nationally known mail-order computer houses (you'll find full-page ads for them in the better computer magazines) and these folks have made it big because they treat their customers right, as far as timely shipments and honoring guarantees go. But for every solid mail-order house there are several that are either ethically suspect or too small to process your order efficiently.

Computer Store Franchises

These chains, like Computerland, are likely to be a good bet overall, but each store is different because it's a franchise, owned by a different person. The stores almost always have on-site training (often a couple of hours free with your purchase and on-site service, as well as a decent selection of merchandise to look through.

The salespeople are often knowledgeable, although you might have trouble getting someone's attention when you come back with a problem. It also seems to be a problem to get salespeople to leave you alone while you look at the merchandise: the managers apparently believe their people aren't helping you if they aren't hovering over your shoulder through every keystroke.

You'll have to evaluate these stores individually. One key to a store's reputation and ability is whether it does consulting for local businesses. A store that does this kind of consulting is more likely to know something about the real, day-to-day problems of a business incorporating a computer into its operations. The advice you get from the store is therefore likely to be more realistic.

Price is not usually terribly flexible at stores like this, although you can usually negotiate some extras like free diskettes and printer paper, or get a deal on the overall price if you buy a total system.

Independent Computer Stores

These can be very good or quite bad, and with them you don't have the overriding protection of the franchisor in case

you have a beef. Nevertheless, some of our favorite computer stores are independently owned, and there are a number of reasons we feel this way.

The service and support are more personal. The store will go out of its way for you to order something it doesn't normally stock, which is a service you may not get anywhere else. Because support and expertise are the main selling points these stores have over franchises, most take pains to have knowledgeable and helpful salespeople who will make appointments to help you (sometimes even after store hours). Your chances of getting a discount are better here than at a franchise, too.

The main drawback of an independently-owned store is that it is likely to be closed nights and Sundays or Mondays (they've got to take a day off sometime!), whereas the larger franchises are open evenings and weekends.

Other Considerations

Other important considerations in choosing a computer store are:

Location Try to find a store that's close to where you live or where you work. That way you can easily return for additional supplies, for information, and, most importantly, for advice and repairs.

System Test and Setup Anyone you buy from should be willing to set up the computer system you buy and let it "burn in" for a couple of hours to make sure it's working properly before sending it home with you. Most of the electrical problems likely to occur in a computer will occur in its first few hours of operation, so the burn-in is a good way to make sure your system works. It's also a good way to make sure all the components are there. The store should also be willing to spend an hour or two with you, at no charge (though perhaps by appointment), to show you how to set up and use the system in general.

Exchange Privileges The store should be willing to exchange software, and perhaps even peripherals like monitors or printers, if you're unhappy with them. The exchange privileges should be good for at least a week, and preferably a month.

You'll probably have to visit several stores to see all the computers you're comparing. Most computer stores carry only one brand of portable. Visiting a lot of stores isn't a bad thing: it makes it easier for you to tell the good stores from the bad ones.

Step Four: How to Buy the Right Computer in the Right Place at the Right Price

Don't Rush!

These are the two most important words to keep in mind when you're in the process of buying the right computer. You probably didn't buy your last car on the spur of the moment, and you shouldn't invest a similarly sizable portion of your income on a computer without some deliberation.

When you look at a particular computer, make sure you check it out to your satisfaction. Don't be turned off by a salesperson who's an ignorant hustler—just thank the bum and find another store that carries the product. If you're unhappy with a salesperson but spot another salesperson who seems more to your liking, seek him or her out another day.

Once you've found the computer you want to look at, and in a comfortable setting, give yourself time to check it out. After the salesperson has pointed out the main features or showed you how to boot a program, ask to be left alone so you can spend some time with the unit. Type on the keyboard. Look at the screen. Monitor your reactions: does the computer feel solid or shaky? Is there a loud fan, or do the disk drives seem too noisy, and do you find that distracting? Is the display clear? Does the keyboard feel comfortable? Are the keys in the right places? Is the key "action" the way you like it?

Spend some time checking out your potential relationship with the computer. If possible, bring in some of the kind of work you expect to be doing with the computer, and try it out for half an hour or so. You'll be amazed how quickly you develop strong opinions when you try your own work on the computer.

Beware of Advice

Advice comes in all shapes and sizes, and from all sources, reliable and unreliable—friends, relatives, casual acquaintances, strangers, and salespeople. The most important thing to remember about any advice is that the person giving it has a reason for giving it, and that qualifies the advice.

A salesperson may advise you to get double-density disks because the store is overstocked in them, not because you really need them. A friend may steer you toward one kind of computer because he loves it, but if it's the only computer he knows, he may simply be using you to justify his buying decision, retroactively. Besides, his needs may be totally different from yours.

A relative may encourage you to buy a machine because it's cheap, but money may not be the major consideration for you. Somebody else might tell you to get the same kind of computer she has so she can swap software with you.

The only way you can judge what's right for you is to know what you want and how different computers do what you want. We hope this book has helped you—and will help you—to determine that.

Getting a Discount

The proclaimed inflexibility of computer prices at places like chain stores and department stores notwithstanding, in the end, everything is negotiable.

The first point to remember is that getting the best price isn't the most important thing. Getting the computer you need, from a knowledgeable and supportive dealer, at a price you can justify—that's the important thing.

The second point is that if you're going to negotiate, make sure you're getting everything you need. The negotiation process gets to be like a shell game, where the dealer will offer to give you a higher-priced printer but take away a software package to meet the price you've suggested.

So before you begin negotiating, have the salesperson write up a configuration list containing everything you need, from computer to printer cable, and the price and model of each item. Then start negotiating.

Most stores will throw in something free (diskettes, printer paper, a programming guide or other book) rather than offer

a discount. Another approach is to ask for a fixed percentage off the top of a package deal. Just remember that most portable computers come with software, disk drives, and display, so they are inherently a good buy, whether you wheel and deal like a carpet seller or just pick and choose and pay list.

A Few Tips for the Raw Beginner

1. Buy everything from the same place, if possible: computer, printer, cables, and major software programs. Even if it costs a little more (and you can often get a discount for buying everything at once), it will save you later grief. Otherwise the software seller will blame the hardware and the hardware seller will blame the software when something goes wrong.

2. Buy for today, and for your *reasonable* expectations for tomorrow. Don't pay in today's expensive dollars for a level of capability you are only guessing you'll need some day in the distant future.

3. Applying a computer to your business or hobby will take time, attention, enthusiasm, and a set of realistic expectations. You cannot plug it in and crank out reports, no matter what IBM's advertising agency says. But your investment of time and energy today will repay you many, many times over in the future—the near future.

4. Join a user's group. That's a club of people who all use the same kind of computer, and you'll find they just love helping out beginners, free of charge. Their expertise, enthusiasm, and willingness to help will carry you over many a rough road. And they are great places to get your one-of-a-kind application problems solved. Computer stores usually carry lists of local user groups for different kinds of computers.

Chapter Six

The Reviews

Introduction

This chapter is divided into three parts to correspond to the three classes of computers: Transportable, Briefcase, and Notebook. You'll notice that the reviews all share the same structure. We begin with the name of the product and the name, address, and phone number of the manufacturer, and then we list the product's features and price. Following that, we launch into a discussion of various aspects of the product, including quality, friendliness, software, reliability, and claim to fame. Each review ends with a set of ratings that correspond to the criteria you established using the Needs Analysis Questionnaire. We list applications for which we feel the computer is most suitable, point out whether it is a portable or transportable computer, and rate software availability, ease of use, and compatibility as *Excellent*, *Good*, *Fair*, or *Poor*. These ratings will help you choose among the computers you selected in the previous chapter as being best suited to your needs.

Glossary of Features

In the interest of saving space, we've used a lot of abbreviations and terms in the Features portion of each review.

These terms have all been discussed in Chapter Three, but here's a quick reference to them, in the order in which they appear in the reviews.

Display The computer screen, where you see the information you enter.

CRT Cathode Ray Tube, like the display in your television.

LCD Liquid Crystal Display, like the display in a digital watch.

Graphics Resolution The display's ability to show sharp, clear graphics—the more dots (or pixels), the better.

Detachable Keyboard Not connected physically to the computer, so you have more freedom to position it to your liking.

Numeric Keypad A set of keys arranged like the number keys on an adding machine. If *separate,* they are separate from the main text-entry keys. If *shifted or integral,* they are the same as some of the text-entry keys, and are activated by hitting a Num Lock or Shift Lock key.

Cursor Keys Keys with arrows on them that are used to move the cursor around the screen.

Processor The kind of computer chip used.

RAM Random Access Memory. The memory used for temporary storage of programs and data.

ROM Read-Only Memory. The memory that contains permanently-stored information, usually system operation or diagnostic instructions or perhaps applications programs.

Bootstrap System start-up and diagnostics software stored in ROM.

K Thousands of characters of RAM or ROM storage.

Mass Storage A permanent, nonvolatile storage area for programs or data.

Disk Drive A mass storage device using mylar disks on which information is stored.

Double-Sided A disk drive that can store information on both sides of the disk.

Double-Density A disk drive that stores information in a tighter, or denser, arrangement.

MS-DOS The major 16-bit operating system.

CP/M The major 8-bit operating system.

CP/M-86 A competing 16-bit operating system.

BASIC The simplest widely-used programming language.

Interface A plug that connects a computer to other devices.

Parallel A plug that allows the transmission of data eight bits at a time.

Serial A plug that permits the transmission of data one bit at a time.

Centronics A common type of parallel interface.

RS-232C The most common type of serial interface.

IEEE-488 A less common type of parallel interface.

Cassette Port A set of plugs that allows a tape cassette to be connected to the computer for mass storage.

Modem Port A plug that allows a modem to be connected.

Modular Telephone Port A plug that connects directly to a modular telephone cord.

Bar Code Port A plug that allows the connection of a bar code reader.

External Video Port A plug for connecting an external video monitor. Some allow the connection of a standard computer monitor, and others (called RF outputs), allow connection of an ordinary television.

IBM-Compatible Expansion Slot Special plugs inside the computer for connecting add-in circuit boards that were designed to fit similar plugs inside an IBM PC.

Modem A device that lets a computer talk to other computers over telephone lines.

Key to the Ratings

Suitability for Specific Applications At the end of each review, we list the applications, corresponding to those in Chapter 5, for which we feel each computer is most suited. When we judge suitability, we take into account both hardware and software considerations. In every case, computers judged suitable for the highest level of an application will also be suitable for lower levels. Thus, a computer suitable for *Heavy Word Processing* will also be suitable for *Casual Word Processing*, and a computer suitable for *High-level Data Base Management* will also be suitable for *Low-level Data Base Management*.

Availability of Software Our ratings here are based on the number of applications programs available that will run on the computer. *Excellent* means there is as much software available as for any comparable computer. *Good* means the selection is broad enough to satisfy almost anyone. *Fair* means you have some choice of programs for the most popular applications such as word processing or spreadsheets, but that you will have little choice in data base management, telecommunications, personal productivity, or programming packages. *Poor* means you're pretty much stuck with one or two selections in each of the six applications categories, if you're lucky.

Ease of Use We rate ease of use *Excellent* if you can be using the computer productively and without constant reference to the manual within two hours of unpacking it. *Good* means this will take from two to eight hours. *Fair* means it will take from eight to forty hours. *Poor* means it will take over forty hours.

Compatibility with Other Computers There is no such thing as complete compatibility between computers, and where compatibility exists, there are several kinds of it. *System Compatibility* means that two computers use the same operating system, which isn't such a big deal because the two could still have totally different ways of reading data off the disks, receiving input from a keyboard, or displaying information on the screen. *Software Compatibility* is better, be-

cause it means that two computers will run the same software package, although it may have to be formatted on disks differently (both a Kaypro and an Otrona will run WordStar, for example, but you can't take a disk from one and run it, without modification, on the other). *Format Compatibility* means that the same software on the same disk will run the same way on two computers. *Hardware Compatibility* means that optional devices like modems, printers, and add-in circuit boards will plug in and run the same on two computers. With this in mind, we rate compatibility *Excellent* if the product is as Format Compatible and as Hardware Compatible as any other computer on the market. Compatibility is *Good* if the product is Format Compatible. *Fair* means the product is Software Compatible. *Poor* means the product is, at best, System Compatible, and probably not compatible at all.

Portability The criteria here are simple: Briefcase and notebook computers are considered *Portable*, while Transportable computers are considered *Transportable*. Portables are light and small enough to go with you almost anywhere on very short notice. Transportables need power and a place to be set up, and will cause you to think twice about whether or not it's really worth taking them someplace.

Transportable Reviews

Actrix

Actrix Computer Corporation, 2159 Bering Drive, San Jose, CA 95131. (408) 263–3660.

Features *Size:* 16″ wide, 11″ deep, 10″ high; weight 33 lbs. *Display:* 7″ amber CRT; 24 lines of 80 chars. plus one status line. *Keyboard:* detachable, 3′ cord; separate numeric keypad, 15 function keys, cursor arrow keys on keypad, delete key, clear screen key, page print key, control lock key. *Processor:* Z80A. *RAM:* 64K, not expandable. *Mass storage:* two $5\frac{1}{4}$″ disk drives, 180K capacity per drive. *Interfaces:* Centronics-type parallel port, one IEEE serial port, two RS-232 serial ports, composite video port; built-in acoustical modem, modular jack modem plug. *Software:* CP/M 2.2, MBASIC, CBASIC, modem program, Perfect Writer, Perfect Speller, Perfect Calc, Perfect Filer, Personal Pearl file management system, Money Maestro home accounting system, Fancy Font print enhance-



Photo 6-1. Actrix (formerly called the Access Matrix).

ment program. *Other Features:* built-in Epson 8-by-9 dot-matrix printer, 80 characters per second; real-time clock. *List price:* $2190. *Options:* 8088/MS-DOS coprocessor, 1200 baud modem, carrying case, uniform disk formatting utility, printer tractor feed, double-sided disk drives, internal battery pack, 8" disk drive interface.

Quality The Actrix (formerly called the Access Matrix) is a classy design, considering the "kitchen sink" conception. The keyboard is low-profile off-white. The orange monitor con-

trasts nicely with the black matte finish in front. Even the telephone acoustic couple ears are tucked away in back.

But the keyboard snaps shut on the front of the unit with a pressure catch that doesn't look sturdy. The flanges that hold the bottom of the keyboard in place look like they could get bent easily in daily use. The orange CRT is out of focus at the edges (a common computer complaint).

The printer built into the top of the Actrix is the well-made Epson, standard of the dot-matrix world. It's slow but has the most wonderful graphics in the world, and prints more quietly than most.

The disk drives are easy to use, but they seem to run constantly, not shutting down during periods of nonuse, which makes the computer noisier than it needs to be. The fan is quiet. There's a slot next to the disk drives to hold extra disks, but it's unfinished metal, which clashes with the designer appearance of the rest of the machine.

Including as it does a complete computer, an entire printer, and earphones for a telephone, the Actrix is massive at 33 pounds. Yet it's well-balanced when picked up by its bar handle.

The computer is an odd combination of overall good appearance marred by small lapses in the design and finish.

Operation and Friendliness The biggest benefit of the Actrix, when it comes to ease of use, is the built-in printer—not so much because it's easy to use (Epsons are okay) but because you don't have to worry about buying and hooking up a printer to your computer. Printer-computer interface is a deep and mysterious art, ill-understood and poorly performed by dealers. Since the Actrix has already plugged the printer in and set up the software to run it, all you have to do is enjoy it. There's even a "page print" key on the keyboard which will print a copy of whatever is on the screen with just the press of a button. That is the height of convenience.

Less convenient is the software, the Perfect Software line, which is of great ambition and limited execution. Before using the programs, you must "unbundle" them, which means performing a series of intimidating file transfers to spread them around the proper disks. Why doesn't Actrix spring for a few more disks and save the beginning user this irritation? This is not user-friendly packaging.

Also ill-advised is putting the cursor arrow keys on the numeric-keypad: just because IBM is dumb enough to do it doesn't mean everybody has to imitate them. You must activate the cursor keys to use them. Imagine how much trouble it would be to use a spreadsheet when you have to switch between using the keys as numbers and using the keys as cursor controllers. We hope this trend is squelched.

The reset button is in the front of the computer, where you can get at it, but you must stick a pencil in the hole to reset the computer. True, you won't push the button by accident. On the other hand, you have trouble pushing it even when you want to. Surely there is another method of making this key safe.

Software Aside from the Perfect line, the software forms a good package. There's MBASIC so you can learn programming, CBASIC so you can run business software, a modem program so you can use the dual modem built into the machine, and an interesting little program called Fancy Font.

Fancy Font is a printing utility that makes use of the Epson's awesome graphics abilities to convert your drab, ordinary, mundane letters and articles into dazzling graphical wonders. The program provides Old English letters, headlines in a variety of sizes, Gothic, script style, even character styles you devise yourself. Just put a few codes in your text and you can print out an entire newsletter that looks like a medieval illuminated manuscript. You've got to see the results to believe it. Including it is a nice, thoughtful touch on the part of Actrix.

The Perfect Software line is less thoughtful, being promoted as the ultimate software package when in fact it is slow and has significant flaws. Our detailed review of the Perfect line appears in Appendix A. It should be noted that on the Actrix, Perfect Writer performs markedly worse than on some other computers, such as the Kaypro. Rapid typing freezes the screen so that nothing is displayed until—ten or fifteen characters later—you pause. Then the screen catches up with a burst of characters. This is completely unacceptable performance for anyone doing touch typing, and for this reason we rate the Actrix acceptable only for casual word processing.

Actrix has added Personal Pearl, a fine file management program that is easy to use (if you take the trouble to follow

the manual). This is suitable for mailing lists, client lists, and other lists that require sorting in various combinations, and a certain amount of summarizing. It is more powerful than Perfect Filer, yet quite easy to use once you get the hang of it.

Also included is Money Maestro, a home accounting/small business checkbook program. We used Money Maestro for two months to organize our checking account and found the program seriously flawed: it forgot items (unforgivable), failed to sort anything (making it inconvenient to use), and took twice as much work to maintain as doing the job manually. It would probably be easier to maintain one's home accounting using Personal Pearl.

Documentation As always, documentation for the Perfect line consists of new covers put on the standard Perfect Software manuals. Except for the fact that the computer is referred to generically throughout the manuals, this isn't all bad since the Perfect manuals are quite good as tutorials, compared to many others.

The CBASIC and MBASIC manuals are simply reference guides to these languages, not tutorials. The MBASIC manual does suggest books to teach yourself that language.

The Actrix is one of the few portables to have a separate, thorough User's Guide explaining the system for the new user. The quality of this guide may be due to the fact that it was written by an outside agency (the Reston Documentation Group, Reston Publishing). Author Linda Griffin-Gold has done a good job of covering the entire computer: setup, transportation, formatting and copying disks, introductory-level CP/M, advanced CP/M, all about the keyboard, how to set the internal clock, using Fancy Font, running the modem, and some technical notes. There's even a troubleshooting appendix, an excellent and rare touch. Actrix is to be congratulated for this manual, in a computer world in which everyone deplores the wretched state of documentation but few computer companies are willing to pay the bill to do something about it.

Claim to Fame Actrix ads show a burro clumsily loaded down with oversized computer components: terminals, keyboards, old-fashioned modems, extra disk drives, printers. This, says the ad headline, is how "some" computer companies produce a portable (i.e., by slapping things together).

On the facing page is the Actrix: computer, keyboard, disk drives, two kinds of modem (one plug-in, one acoustical), and a whole printer—everything in one big box. What more could you want? Oddly, the picture of the Actrix makes it look as much like a kludge as the overloaded burro.

This computer is for someone who must bring the printer everywhere he goes. We know a painter who lugs this thing with him to make estimates. But how many people just have to have an all-in-one computer?

This would have been a better idea if the printer and the acoustical ears could be detached. Then you could take the printer when you needed it, or leave it (and eight pounds) behind when you didn't. Instead, every time you move, you take it all with you, need it or not.

On the other hand, because of the cost savings involved in bundling everything into one big package, this is a lot of computer for just $2190—elephant or not.

Best Idea The Actrix User's Guide.

Worst Idea The printer cannot be removed.

Comments You want this computer if, like our friend the painter, you take it on the job to give estimates and you need to leave a printed copy. While it is a lot to carry, it requires no setup time (except inserting the paper) and takes up no extra room on the table.

You might also want this computer if you are deathly afraid of printers, or don't trust your dealer to be able to hook up an Epson, or don't want to have to figure out what printer to buy (this is carrying Adam Osborne's "one buying decision" to its logical limit). Actrix has completely eliminated the need to think about your printer's interface.

On the other hand, the screen could be crisper (we don't like the lack of true descenders on the characters), and we don't rate it for heavy spreadsheet work. Perfect Writer shows unacceptably poor performance, so it's not suitable for heavy word processing either.

Ratings This computer is suitable for: Casual Word Processing, Casual Spreadsheeting, Low-level Data Base Management, Heavy Personal Productivity, Lengthy Telecommunications, and Simple Programming. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Good. *Portability:* Transportable.

Attaché

Otrona Advanced Systems, 4755 Walnut Street, Boulder, CO 80301. (303) 444–8100.

Features *Size:* 12″ wide, 13″ deep, 6″ high; weight 19 lbs., metal case. *Display:* 5″ green CRT; 24 lines of 80 chars. (software-selectable 40 double-sized chars.); 320×240 pixel graphics resolution, underlining, boldfacing etc.; Greek alphabet, mathematical symbols. *Keyboard:* detachable; 62 keys, no keypad, 34 programmable function keys; large backspace key, arrow keys in L shape, reset key, audible keyclick. *Processor:* Z80A. *RAM:* 64K. *Mass storage:* two slimline $5\frac{1}{4}$″ double-sided, double-density disk drives, 360K capacity per drive. *Interfaces:* serial printer port, serial modem port, external video port, bus external expansion port. *Software:* CP/M 2.2, WordStar 3.3, Valet integrated appointments calendar and communications program, Charton II business graphics program, Multiplan spreadsheet. *Other features:* real-time clock, fan. *List Price:* $2995. *Options:* 8-bit/16-bit 8086 coprocessor version, 256K RAM, two 320K disk drives, MS-DOS, CP/M 2.2. *List Price:* $3795. 10-megabyte external hard disk drive, $2620. 8087 math coprocessor, $425. Battery pack, DC power option, carrying case. Expansion slot makes custom interface possible.

Quality Otrona has been making the Attaché long enough for the quality to show: technicians who repair them say the Attachés are among the best-made portable computers on the market. "All the pieces only go in one way, so you can't repair them backwards," commented one repairman who liked the Attaché's ease of service.

The disk drives are rubber shock mounted so they stand up to traveling better than most. The handle is large and sturdy and doubles as a tilt stand for the computer. The sculptured keyboard is tiny and appears crowded, but the positive feedback and the keyclick sound make typing easy. The screen is as small as the oft-criticized Osborne 1 screen, but the amazingly high resolution of the screen permits 80 characters per line to be readable and also handles graphics, the Greek alphabet, math equation symbols, and business forms. It also displays boldface, underline, strikethrough, superscript, and subscript directly on the screen (one of the

very few computers to do so). The results are dramatically visible in WordStar: for the first time, you really do see what you get!

Operation and Friendliness Otrona has gone to the trouble of integrating its software into the hardware, making the Otrona easier to operate. The function keys (the row of number keys across the top of the keyboard) are automatically assigned for each program loaded. Most of the WordStar commands are on the function keys, which are labeled for WordStar. As a result, WordStar can be learned quickly and easily. And the correct display of underlines and boldface on screen means you don't have to learn the screen symbols either.

The Valet "resource management" program is an appointments calendar that will set off a preset alarm and interrupt whatever you're doing on the computer, load an alternate program you might need, then return to the previous program, work intact, when you've done your timed task. This kind of friendly user interaction is usually seen only on notebook computers.

Otrona has optimized the CP/M operating system, the disk, and the screen interfaces to make the computer run faster. The result is one of the fastest disk-access computers on the market.

The price of the Attaché, originally $3995, has been dropped a thousand dollars, and an IBM-compatible upgrade is now available with 256K RAM for $3795. A connector makes it possible to hook up the computer to an STD expansion bus card cage, so additional computer cards may be added.

Software WordStar is already a good program, but on the Attaché it shines. It's hard to tell which will be more appreciated, the real screen display of print formatting, or the preset and labeled function keys that make it easier to learn. Because of the extra convenience of WordStar and the display, we rate this computer as appropriate for heavy word processing, despite the 5″ screen.

The Charton graphics program produces pie charts, bar and line graphs, and makes use of the Attaché's impressive graphics set. The Attaché is fast and sophisticated with graphics.

Valet is the Attaché's special pride and joy. Unique to

the Attaché, Valet is a sort of super-controller/calendar/secretary that handles data communications with modems or networks, acts as an on-screen calculator, and sets an alarm that will interrupt whatever you are doing and print a message on the screen. It will also let you interrupt whatever you are doing temporarily while you run a different program, then return you to just where you left off. This kind of capability is usually seen only in expensive 16-bit programs.

Multiplan is an advanced and highly regarded calc program with advanced features; it is comparable to SuperCalc 2 and VisiCalc Advanced Version, and superior to Perfect Calc. With an external monitor, the Attaché would be suitable for heavy spreadsheet work.

Documentation Otrona provides manuals for the software and an owner's handbook for setting up the system. The manuals are well illustrated and well organized. Also included is the book "CP/M Handbook" by Rodnay Zaks, as a welcome substitute for the impenetrable CP/M Reference Guide.

Reputation/Reliability The Attaché has a reputation for reliability, speed, and convenience of use. The unit is exceptionally well made, with shock absorbers for the disk drives and a power supply that will carry you over brief brownouts. The computer has been selling for two years now, making it one of the more time-tested portables on the market.

Claim to Fame This is one of the smallest and lightest transportables, with an excellent reputation for quality performance.

Best Idea A screen that displays underlines, boldface, and other WordStar print formats.

Worst Idea We can't really point to anything wrong, unless it's the price which has always been just a little out of reach.

Comments The Attaché has always seemed to be the Porsche to the Osborne 1's Volkswagen. Its high price ($3995 until recently) has kept it from achieving the wide sales of the Osborne—but you also could say that about the Porsche by comparison to Volkswagens, we suppose.

Attaché has joined the move toward IBM–PC-compatibility (at the MS-DOS level rather than full compatibility), but again price is a question. The 16-bit version of the Attaché is $3795, which is a good price considering the quality of the machine (and the speed of the 8086 processor, said to be

three times faster than IBM's processor). On the other hand, for the same money you can get a Compaq which has a nine-inch screen (but not the software). And at $2995, the 8-bit Attaché is clearly not trying to compete on price either. The Attaché's quality may be worth the small differential; but it's hard to say whether the general bargain-hunting public will see it that way.

Ratings This computer is suitable for: Heavy Word Processing, Casual Spreadsheeting, Low-level Data Base Management, Heavy Personal Productivity, Brief Telecommunications, Advanced Programming. *Software Availability:* Excellent. *Ease of Use:* Good. *Compatibility:* Good. *Portability:* Transportable.

Chameleon and Chameleon Plus

Seequa Computer, 209 West Street, Annapolis, MD 21401. (301) 268–6650.

Features *Size:* 18″ wide, 15½″ deep, 8″ high; weight 28½ lbs. *Display:* 9″ green phosphor CRT; 25 lines of 80 chars; 640×200 pixel graphics resolution. *Keyboard:* IBM-compatible; detachable; 83 keys, including 10 function keys and separate numeric keypad. *Processor:* 8088, Z80. *RAM:* 128K (Chameleon Plus: 256K). *Mass storage:* two 5¼″ single-sided, double-density disk drives, 160K capacity per drive; (Chameleon Plus has 320K double-sided drives). *Interfaces:* RS-232 serial port, parallel port, external video display port. *Software:* MS-DOS, Perfect Writer, Perfect Calc, MBASIC; (Chameleon Plus also includes Perfect Speller and Condor I data base management software). *List price:* $1995 for Chameleon, $2895 for Chameleon Plus. *Options:* 6-slot, external, IBM-compatible expansion chassis, $600; color interface, $49; 8087 co-processor, $320; one-year extended warranty, $245.

Quality This appears to be a very well-made computer. The case is metal, which makes the unit a little heavier but also eliminates the seam-fitting problems so common with plastic cases. The keyboard is soft but responsive. The monitor is clear. The internal fan is located in the back of the unit (so it doesn't blow in your face) and is very quiet.

Operation and Friendliness The Chameleon was easy to set up and run. As easy, that is, as one can expect for a computer that runs under MS-DOS. The only hardware consideration

that limits its ease of use is that, as with so many other portables, the plug-in for the keyboard is located at the rear of the unit, so just about all of the cord's length is used just getting it from the plug-in to the keyboard. You can't move the keyboard very far away from the rest of the computer. Otherwise, the keyboard itself is another carbon copy of the IBM PC keyboard, with the exception that the "shift lock" and "num lock" keys have LED indicators to tell you when they're engaged. Nevertheless, the layout is the same as IBM's which means that the "return," "shift," and "cursor control" keys are all in weird places. It will take some getting used to.

The Chameleon produces an audible click when you strike each key, but as this is produced through the unit's speaker and sound generator, you can turn it off if you like. As for other controls, the monitor only has an adjustment for brightness (not for contrast), and this is located at the back of the computer, which isn't too convenient (although one could argue that once you set this knob, you never touch it again). As with the Otrona Attache, the Chameleon's handle doubles as a stand for the computer by folding under it.

Finally, there's no room inside the computer itself for



Photo 6-2. Chameleon.

carrying diskettes or the manual, as there is in the Columbia. ***Software*** The software supplied with the Chameleon is Perfect Writer and Perfect Calc, both of which are discussed in Appendix A. The software runs the same on this computer as it does on other IBM compatibles.

Documentation The user's manual for this computer is extremely basic in nature. You're pretty much dependent on your dealer for answers to technical questions. The fifty-page manual covers things like how to insert diskettes in the drives, how to plug in the power cord—useful information, no doubt, but not much help when the text you're displaying starts creeping to one side of the screen. The manuals for the software are supplied by the software makers, Perfect Software and Microsoft (for the MBASIC and MS-DOS).

Reputation/Reliability Seequa Computer was founded at the end of 1979 by a University of Maryland finance instructor and one of his students. The company spent its first two years building private-label computers and terminals for major corporate clients, and then announced the Chameleon late in 1982. Shipments began about six months later. Seequa has about 300 Chameleon dealers across the country, and they wisely stopped looking for new dealers shortly after demand for the computer began to exceed supply, presumably because they didn't want anyone waiting forever to get a unit. We admire this approach, and think it shows that Seequa is, unlike many other new computer companies, taking things a step at a time, making no outrageous promises about when it can deliver its products, and doing its best to support the products that are out there.

The upgrades and enhancements for the computer have appeared about two months after they were promised, but that's practically an on-time record in this business. Dealers are responsible for servicing the units, but Seequa has a technical support hotline that appears to be staffed with responsive, knowledgeable people. One dealer we interviewed said he could get replacement parts from the company within forty-eight hours.

As for reliability, the computer has no long-term record of use at this writing, but Seequa has made improvements to the Chameleon's circuit board that suggest it is trying to maintain quality and fix any flaws in early models. The deal-

ers we talked to couldn't identify any particularly consistent hardware or software problem with this unit, but this is based on a total number of units sold in the neighborhood of three to four thousand. The Chameleon and Chameleon Plus are warranted for ninety days, but you can buy an extended, one-year warranty if you like.

Claim to Fame The Chameleon's obvious claim to fame is its price. At $1995, it is the cheapest IBM compatible by $1000. At this point, it will run IBM software as long as the program isn't written in IBM BASIC. Seequa is about to release a version of Microsoft's GW BASIC, though, which should allow the Chameleon to run those programs as well. Seequa's other claim to fame is its dual processors. At one point we suppose it was a good idea to have a Z80 processor as well as the 8088, but with the growing collection of first-rate software for MS-DOS, we doubt that many people will use the Z80 side of Chameleon for long. Seequa makes it a little harder to use the Z80, since it doesn't supply the CP/M operating system with the computer. You have to buy it separately, and as we said, once you look at the MS-DOS software, you probably won't want to bother getting the Z80 up and running.

Comments The Chameleon is a serious player in the transportable sweepstakes. It runs the most popular IBM software (and will soon run more) and it's very inexpensive, considering its capabilities and the quality of construction. The company isn't nearly as big a name as Corona, Compaq, or Columbia, so you'll have to search a little harder to find a unit to look at (we suggest calling Seequa and asking for a dealer near you—they're very helpful about it). Also, the shortage of dealers cuts down on service availability if you're on the road.

You're stuck with Perfect Writer and Perfect Calc, neither of which lives up to its name, but the system price is low enough that you could buy other software and still be ahead of the game. One way Seequa cut corners here was in leaving out the internal expansion bus, which means you can't expand the memory internally to more than 256K, and you can't plug in an internal modem or clock card. Extra memory will be available outside the computer, though, on the external expansion chassis, so if you don't think you'll need to

take the extra RAM with you (and we suppose you could always carry an external modem along, too); this isn't much of a drawback.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, High-level Data Base Management, Advanced Programming, Lengthy Telecommunications, and Heavy Personal Productivity. *Software Availability:* Good. *Ease of Use:* Fair. *Compatibility:* Good. *Portability:* Transportable.

Columbia VP

Columbia Data Products, Inc., 9150 Rumsey Road, Columbia, MD, 21045. (301) 992–3400.

Features *Size:* 18″ wide, 16″ deep, 8″ high; weight 32 lbs. *Display:* 9″ green phosphor CRT; 25 lines of 80 chars., 640 × 200 pixel graphics resolution. *Keyboard:* identical to IBM PC; detachable, 3′ cord; 83 keys, including 10 function keys and separate numeric keypad. *Processor:* Intel 8088. *RAM:* 128K, expandable with piggyback board to 256K. *Mass storage:* two half-height, 5¼″ double-sided, double-density disk drives, 320K capacity per drive. *Interfaces:* Centronics-type parallel port, RS-232 port; IBM–PC-compatible internal expansion slot. *Software:* MS-DOS operating system, Perfect Writer, Perfect Speller, Perfect Calc, Perfect Filer, Perfect Link, Perfect Software Tutor, Home Accountant Plus, Fast Graphs, GW BASIC, MACRO Assembler, CP/M-86, Space Commanders. *List price:* $2995. *Options:* 128K RAM expansion, $375.

Quality On the outside, this computer has some fit and finish problems. On one unit we saw, the nameplate was slightly crooked, and one of the latching tabs that holds diskettes in place when you close the disk drive door was bent so that the door wouldn't close properly. We bent it back into place so the drive would work, but the defect left us with an uneasy feeling.

The VP's keyboard has a definitely spongy feeling. The IBM keyboard gives you a nice, positive click that you can feel as well as hear, but this keyboard sort of squishes when the keys hit bottom. Nevertheless, the keys do rebound very quickly, so you can type rapidly without worrying about missing characters. It's just that you can't really tell when a key has made contact.

Operation and Friendliness This computer operates almost

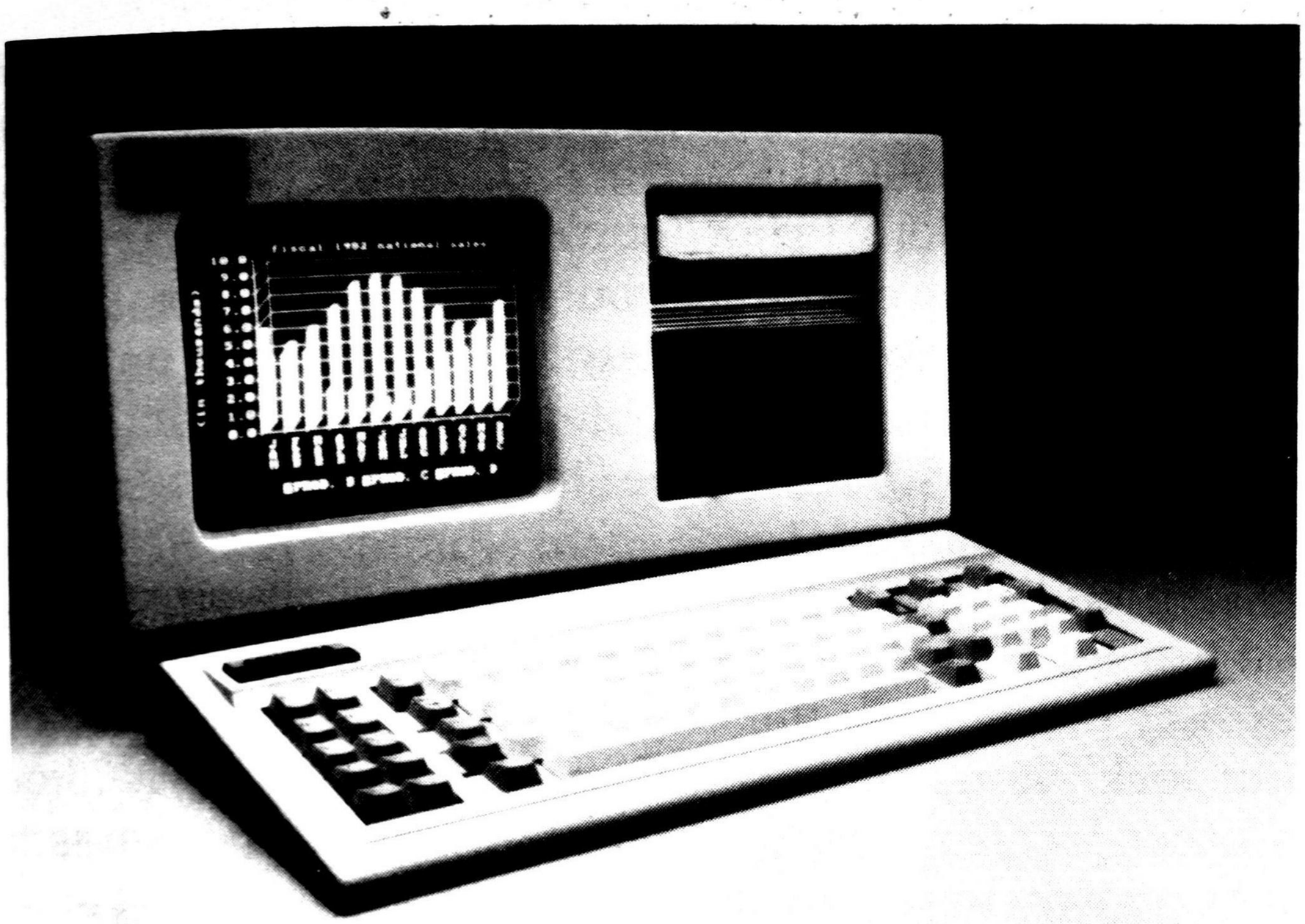


Photo 6-3. Columbia VP.

exactly as an IBM PC does, which means some good things and bad things as far as friendliness goes. On the plus side, the disk drives are fast and not terribly noisy, and there were no problems getting the software to run. Instead of doing a self-diagnostic routine upon power-up, as the PC does, this computer asks you if you want to check the memory. If you don't, it goes right into MS-DOS. The buzzer that sounds when you turn on the system or make an error is particularly annoying when you first hear it, but you get used to it. The internal fan is noisy enough to hear from across a typical office.

The keyboard's 10 function keys are used to make much of the software easier to run. Instead of typing control-key sequences, you just hit function keys to make the programs do various things. This makes them easier to learn (especially if the software comes with a function key overlay to identify what each key does in that particular program) and a little quicker to use.

The display is fairly clear.

On the negative side, we must point first of all to the

keyboard, which in key layout is an exact duplicate of the IBM PC's. This means that the "shift" and "return" keys are not in their traditional locations. This is a genuine pain in the neck if you do a lot of touch-typing. Instead of getting capital letters, for example, you get a / mark. You get used to this layout in about ten hours, but it's agony until then, and afterwards you have problems with all the other keyboards in the world, where the "shift" and "return" keys are in their traditional places.

Another keyboard problem is that the cursor control arrows are built-in to the numeric keypad. When the "num lock" key is engaged, the keypad types numbers, and when "num lock" is not engaged, you can use the arrow, home, and other locator keys. The problem with this setup is that there's no way to tell when "num lock" is engaged. It doesn't click into a down position, and there's no LED indicator in it that lights up to tell you which mode you're in. This wouldn't normally be a problem if you left the numeric pad inactive, but you can hit the "num lock" key accidentally and then sit there wondering why the cursor won't move, especially if you're running software where cursor movements are needed in non–data entry modes, as in making menu selections. (If you're in a data entry mode, obviously you'll see a number on the screen instead of having the cursor move.)

You have the same problem with the "shift lock" key, although in this case the results of being in lock mode are more immediately obvious. Some software packages have added their own on-screen indicators to show whether or not one of these keys is engaged, but Perfect Software's packages don't fall into this category, and they're what the computer is bundled with.

As for compatibility, the Columbia ranks right up there with the best of its competition. Columbia publishes a list of IBM software that will run without modification on the VP, and it includes many of the major word processors, spreadsheets, programming languages, and other applications. Unlike Compaq, however, Columbia doesn't offer a listing of software that does *not* run on the VP, which means that either there's more of it than they'd like to admit, or they haven't checked out enough programs to be sure. According to one report by Future Computing, a market research firm, the Columbia runs "nearly all" IBM PC pro-

grams without modification and has identical graphics as well. The Columbia graphics board, however, is proprietary, and other interface boards such as the Quadlink are not compatible because of the location of the Columbia's disk drive controller.

Software The VP is bundled with a large array of software, much of which is supplied by Perfect Software. Included is Perfect Writer, Perfect Speller, Perfect Calc, Perfect Filer, and Perfect Link. The bundle also includes Microsoft GW BASIC and MACRO Assembler, Innovative Software's Fast Graphs, Continental's Home Accountant Plus, CP/M-86 from Digital Research, Space Commanders, Diagnostics, and Columbia Tutor.

The Perfect Software bundle functions about the same as it does on other computers. The manuals are identical to those found with Perfect software anywhere, except the Columbia logo is printed on the covers. The software uses the Columbia's function keys, but the manuals don't mention this because they were written for use with computers without function keys, and Perfect didn't bother to change them. The only help you get with using the function keys is a quick reference card that shows a function key diagram and the labels for each key. There's a reference card for each of the Perfect Software packages. Be careful unpacking your manuals, because if you lose the small reference cards, you'll have no way of knowing what you can do with your function keys when using these packages. A complete description of the promise and perils of Perfect Software will be found in Appendix A.

Among the computers we've evaluated, Perfect Link is supplied only in the Columbia VP's software bundle. We therefore review Perfect Link here.

Perfect Link is Perfect Software's telecommunications program. The version supplied with the Columbia VP has a sixty-page, typewritten manual that is, in a word, awful. It provides a poorly written and thoroughly confusing presentation of the configuration and functions of the program in what appears to be almost random order. Certainly the subjects aren't covered in the order in which a normal user would encounter them. Entering terminal mode to establish a connection, for example (surely a basic function of a communications program), isn't discussed until page thirty-six.

The program works largely through the function keys. You see a main menu upon booting the program, and you can select different send-receive, file management, or configuration modes from there. The actual communications part of the program is handled through multiple-keystroke sequences with the "control" and "alt" keys, so the part of the program you'll need the most in day-to-day operation is the toughest to learn and use. You can send files with or without error-checking protocols, which is a nice feature, and there's a connect-time clock that monitors the length of your calls, which is also nice. On the whole, though, we find that in an IBM-compatible software market that has already produced some excellent communications programs, Perfect Link is a poor example of the genre.

Microsoft's GW BASIC and MACRO Assembler are good programming tools, but if you don't know anything about programming, you'll have to look elsewhere for help. The manuals supplied with the Columbia assume you have a fair amount of programming experience. They show you how to use these particular packages to program, not how to program. Nevertheless, the Microsoft packages are good tools for the experienced programmer.

Fast Graphs allows you to create bar, line, or pie graphs from numerical data. The data can be entered manually on a spreadsheet-like screen, or it can be loaded into the program from either DIF or ASCII files, which are the two most common file structures spreadsheets use. The program will work with Perfect Calc as well as SuperCalc, VisiCalc, and Multiplan.

Working with a few main menus, the program allows: quick and easy creation of the three kinds of graphs; editing of the data being graphed; merging of title screens with graph screens (so your company logo can be put on a graph, for example); creation of graphs in either black and white or color; editing graphic screens; and storage and retrieval of a series of graphs in sequence, as a sort of slide show which can change screens automatically or upon your command. The program is quite flexible, and the manual is very thorough and easy to follow. The only problem we see is that your data screens can contain a maximum of seven columns. You're allowed to graph from a collection of up to six data screens, so that your graphs may contain as many as 72 bars,

but you'd have to create individual data sets instead of one big one to do this.

The manual covers each program mode in detail, and contains appendices with individual printer configuration information, cable pin hookups, and assistance with creating combination graphs (a combined bar and line graph, for example). There is no index, but the sections and program functions are separated well enough that you wouldn't have to look through more than a couple of pages to find what you were after once you located the correct chapter.

Home Accountant Plus is the 16-bit version of Continental's Home Accountant, which is by far the best selling personal finance management package on the market. It is very powerful and fairly easy to use, and is accompanied by an excellent manual. The Home Accountant will track not only regular income and individual expenses, but also will track the growth of investments and the decline of long-term liabilities. It will print checks, reconcile bank statements for up to five checking accounts, record expenses in up to one hundred different categories, print personal net worth statements, and create bar, line, or linear regression graphs of overall account activity or the activity of selected expense or income categories. You can search transactions and get reports for any category—from your total financial activity in a year to how much you spent on dry cleaning in April, or from how much the value of your money market fund increased in February to the payee of a check you wrote six months ago. This is Home Accountant's power. Indeed, this program is so powerful that a fair number of its users are not individuals but small business owners who use it to keep the books.

Home Accountant's ease of use is achieved through a menu-driven system in which main functions of the program are separated. Under the Transactions module, for example, a menu gives you choices for recording transactions involving checkbook, cash, or credit card. By making these distinctions for you on the menus, the program saves you the trouble of coding them yourself, which can get complicated. The difficulty with this menu system is that, like any heavily menu-driven program, Home Accountant can be hard to get around in a hurry. You find yourself moving from menu to menu, and you sometimes feel as if you need a road map to

remember which branch of which submenu off the main menu you're currently on. In fact, the manual does provide a road map, so at least the manufacturer is acknowledging this kind of problem. Another problem is that you can only enter one transaction per screen, and you can only view one transaction per screen when you search (unless you want a report on a whole category). This makes entry and review of information a little slow.

Nevertheless, this is the best-selling program in a fairly crowded field of competition. The manual makes it fairly easy to set up on the system (which is the hardest part of any accounting program), and if you have any problems during setup or use, Continental has an excellent customer service department that can handle any question you may have.

CP/M-86 is Digital Research's answer to MS-DOS. As shipped, this operating system is like a fifth wheel with the Columbia, since none of the software in the bundle runs under it. But if you have your heart set on a program that runs only under CP/M-86 then it will be nice to have this.

Space Commander is one of those "blast 'em" arcade-style games. If you're buying a computer to play games, we suggest an Atari.

The Columbia Tutor is, frankly, a joke. It consists solely of a verbatim transcript of part of the Operations Guide. In effect, it gives you the choice of reading basic information about the computer on paper or on your computer's screen. The only hands-on training you get from it is loading the diskette and hitting the "return" key to change from one screen to the next. A serious on-screen tutor is a great idea, but this isn't one.

Documentation There is one Operations Guide supplied with the VP exclusive of the various software manuals. It's typewritten, about 150 pages long, and not exactly what we'd call friendly. If, for example, you simply want to set up the system, boot MS-DOS, and then boot Perfect Writer to get a quick memo out, you have to plough through Chapters One, Two, the beginning of Three, and Appendix H. Actually, you could refer just to Chapter One and Appendix H to get this done, but you'd have to figure that out for yourself.

Basically, the problem with this manual is that it's written as if your primary interest is in knowing all of the little

technical ins and outs of the system, rather than just getting it running. It treats fundamental operating information and fairly detailed reference information equally, mixing them together so you have to read through one to get to the other. You find the basic setup and startup information in isolated paragraphs among technical descriptions of what sections of memory are being addressed by the test function, or how to have the monochrome display converted to 220 volts. As a new user, you probably don't care how big the power-up ROM is, or what kinds of how many beeps will sound on the buzzer according to the type of error; you simply want to get the system running.

There is an index, but referring to it is chancy, because most of the listings refer to subheadings the manual's author feels are important, like the memory test, or the bad sector map. If you make your way to the appendices, particularly Appendix H, you'll find fairly straightforward instructions for loading MS-DOS and Perfect Writer. The appendix section offers brief descriptions of the features of Perfect Writer, Perfect Calc, and Perfect Filer (but not, oddly enough, Perfect Link or Perfect Speller), and is really what you need to get on with your work.

Reputation/Reliability The VP comes with a ninety-day parts and labor warranty. Service is available at 175 Bell & Howell service centers located in major metropolitan areas around the United States. At this writing, the VP has only been available for three months; no glaring or consistent hardware defects have emerged.

Claim to Fame The Columbia VP's big pitch is its compatibility for a relatively low price. It is, indeed, very compatible with IBM PC software, but its limited expansion chassis makes hardware compatibility a little more difficult. The brochure says that the unit is plug-compatible with PC add-in hardware, such as modems, color graphics, memory expansion, and other applications. With only one expansion slot, though, you can only have one of these at a time (except for the 128K option, which doesn't use the expansion slot because it piggybacks to the motherboard). On top of that, it's not compatible with IBM graphics boards or some add-in memory and interface boards. Nevertheless, you do get a computer with two disk drives that runs a lot of PC software and comes

with a relatively large (if not exactly first-rate) software bundle for only $2995, which is well over $1000 less than what you'd pay for a comparable PC.

Comments If you want a cheap PC knockoff, this is about as cheap as you can get for this level of compatibility. We can't recommend the software bundle, on the whole, because of the Perfect series, but you would still be ahead buying the computer and substituting a couple of good packages like Lotus 1-2-3 and WordStar. We have reservations about the quality of construction and reliability, but it's really too early to tell whether or not these fears will be borne out in widespread use. One way to check on this is to call your nearest Bell & Howell service center and ask how many Columbia computers they've seen lately.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, Advanced Programming, High-level Data Base Management, Heavy Personal Productivity, and Lengthy Telecommunications. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Good. *Portability:* Transportable.

Compaq

Compaq Computer Corporation, 12330 Perry Road, Houston, TX 77070. (800) 231–9966.

Features *Size:* 20″ wide, 16″ deep, $8\frac{1}{2}$″ high; weight 28–31 lbs. *Display:* 9″ green CRT, 25 lines of 80 chars; 640×200 pixel graphics resolution. *Keyboard:* IBM-compatible; detachable, 6′ retractable cord; 83 keys, including 10 function keys and separate numeric keypad. *Processor:* 8088. *RAM:* 128K, internally expandable to 512K. *Mass storage:* one or two $5\frac{1}{4}$″ disk drives, 360K capacity per drive. *Interfaces:* parallel port, three external monitor ports (composite video, RGB, and RF outputs); three internal, IBM-compatible expansion slots. *Software:* MS-DOS operating system and Microsoft BASIC. *List price:* $2495 (single disk drive). *Options:* second disk drive, $595; communications card, $115; 64K memory expansion, $160; nylon carrying case, $75.

NOTE: Compaq has a second model, the Compaq Plus, which is identical to its original computer except that it features a built-in, $3\frac{1}{2}$″ hard disk drive with a capacity of 10 megabytes

along with a 5¼" floppy disk drive with 360K capacity. Compaq has made much of the fact that the hard disk drive is mounted with rubber mounts to reduce damage from hard knocks in transit. The Compaq Plus is priced at $4995.

Quality The Compaq is housed in a plastic case that seems remarkably flimsy: you can make it bow easily by applying light pressure to the side above the monitor and disk drives when the unit is opened. In recent advertising, Compaq has been at pains to point out that the computer is protected by an inner metal housing, so perhaps the softness of the plastic isn't a serious issue. Still, we wonder how much it would have cost them to put the computer in a decent plastic or metal case to begin with. Aside from the case, this is a solid-looking computer.

Operation and Friendliness The 9" display on the computer is clear and has a front-mounted brightness setting, but the plastic bezel around the screen obscures some of the edges of what's being displayed, so that the top and bottom lines

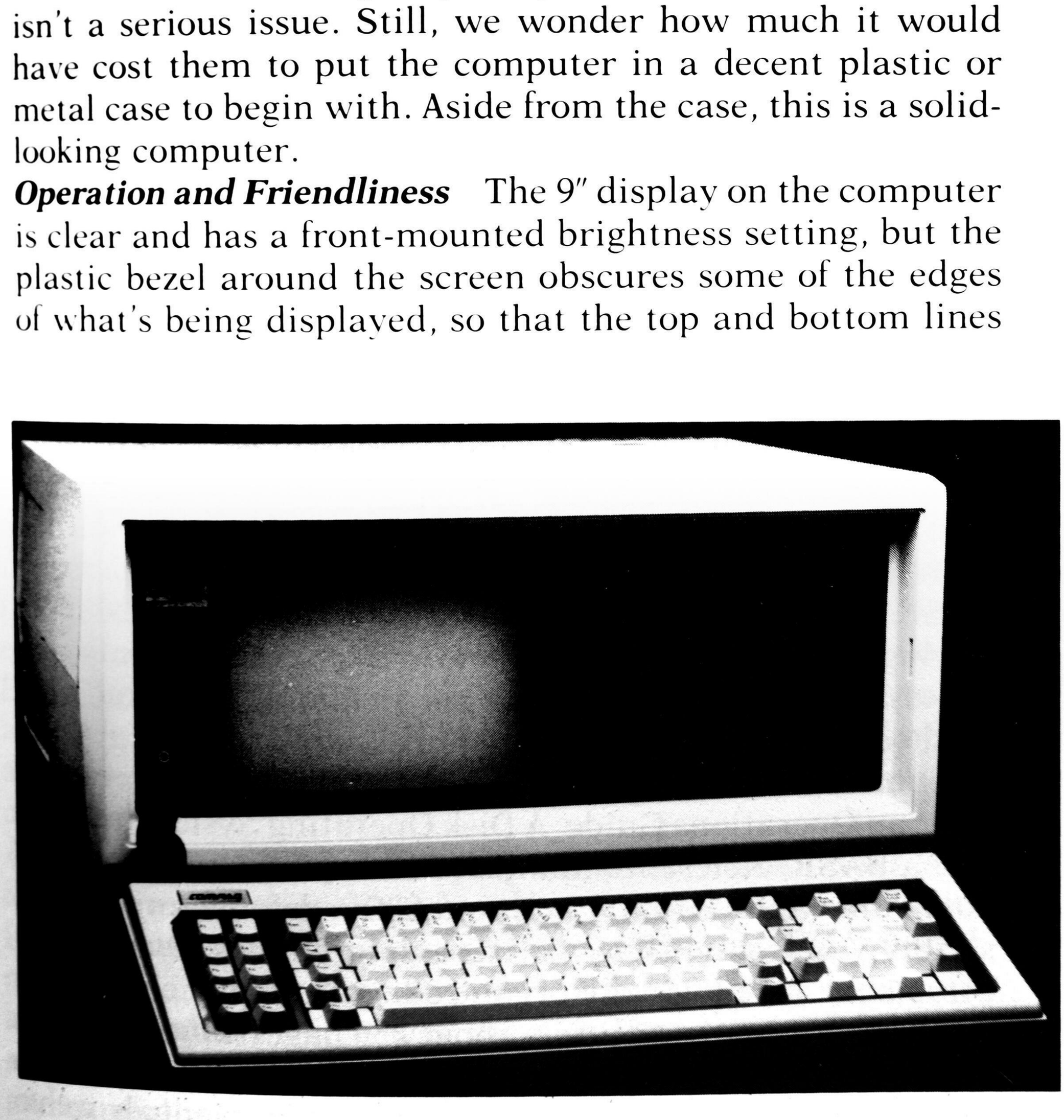


Photo 6-4. The Compaq Portable Computer, a full-function personal computer, is the first that can run all the popular software packages available for the IBM Personal Computer without modification. The Compaq Computer is a 16-bit system with a high-resolution, 9-inch video display, 128K bytes of Random Access Memory, and 5¼-inch floppy disk drives with 360K bytes of storage capacity, all in a 28-pound, self-contained unit.

of whatever is on the screen are difficult to see. This is particularly annoying when you're using a program that lists the major commands at the bottom of the screen or features a status line at the top. The disk drives are fast and quiet, but the internal fan isn't as quiet as on some other models we've tested.

As for the keyboard, it is laid out identically to that of the IBM PC, and while it doesn't feature the breakover keys of the IBM, it has a solid yet responsive feel. One nice feature of the keyboard is that the cord retracts into a hole in the front of the computer unit instead of connecting at the back of it. The cord is about 2′ long. The keyboard has little plastic feet that pop out of its underside to elevate it at an angle. These don't lock into place, but because they open to the sides of the keyboard instead of front-to-back, there shouldn't be any problems with stability. There are similar feet underneath the computer unit so you can elevate it to a better viewing angle during operation. The keyboard locks into the main computer unit with two plastic sliding bolts on its underside. The bolts only extend into the computer about $\frac{1}{8}$″, which left us a little uneasy, and they could have been easier to operate.

Software The only software supplied by the factory for the Compaq is the MS-DOS operating system and the Microsoft BASIC, so buying this system forces you to make a few more buying decisions about applications packages. That's not necessarily bad, though, given the mediocrity of some bundled software we've seen.

Documentation This computer is supplied with three manuals: an Operations Guide, A Disk Operating System manual, and a BASIC Reference Manual. All three volumes are thorough and well-written. Each contains a detailed preface describing the contents, as well as a decent index. Overall, the three books are logically organized.

The Operations Guide is about 250 pages long, including three appendices. It covers setup and basic operating procedures of the Compaq. It is one of the few manuals we've seen that provide you with the disk-copying procedure right up front. With any MS-DOS computer, copying disks is a very important activity, one that you do before you use any software you have, and it's nice to see such a fundamental operation given such early and thorough treatment.

The manual goes on after chapter one to describe the relationship of DOS to the computer and software, how to name files, how to create simple mathematical programs in BASIC, how to use the extensive user diagnostic system of the computer, and what sort of options are available for the unit. The first of the three appendices summarizes the primary DOS commands. The second offers a short but extremely useful and honest discussion of the hardware differences between the Compaq and the IBM PC—important information when you're using a PC compatible. The third appendix is a glossary of terms used in the manual. Throughout, the manual contains numerous screen illustrations to show you what the display should look like during various functions.

The DOS and BASIC manuals are equally enlightening. The DOS manual is 160 pages long, beginning with an introduction to DOS, describing in greater detail its function in relation to programs and the computer. Following this are sections covering all the DOS commands in detail, as well as the use of *Edlin*, *Debug*, and *Link*. The 300-page BASIC reference manual is just that: it describes all the statements, functions, commands, variables, constants, expressions, and operators available in the Microsoft BASIC. It also covers the use of the computer's 10 function keys to facilitate editing in BASIC, and how to reprogram them. The appendices cover error messages, how to perform calculations not intrinsic to BASIC, and the ASCII character codes. This manual is strictly a reference book. If you want to learn to program, you'll need a tutorial book of some kind (we suggest some in Appendix B).

Reputation/Reliability Compaq Computer Corporation was founded in February 1982 by three executives from Texas Instruments. The company secured a substantial amount of private financing on the strength of its management team and the product, which was the first IBM-compatible portable. The Compaq computer has been effectively marketed and carefully manufactured, so that it now enjoys an undisputed place as the best and most compatible of the IBM clones. The Compaq is one of the two or three best selling portables on the market, and is widely regarded as a sound, reliable product.

Claim to Fame The Compaq's claims to fame are its vir-

tually complete software compatibility with the IBM PC and its low price. In the grand tradition of portable computers, it offers an excellent price/performance value in a relatively small package.

Comments If you're looking for an IBM computer and want to save money, this unit is an excellent choice. It is widely sold and supported, it has a good reputation, and it costs less than a comparably equipped IBM (it's $500 less than the new Portable PC). You don't get any free applications software in the bargain from the factory, but you might well be able to swing a good discount on included software when you buy this product from a dealer.

Ratings Suitable applications: With the correct software, this will be a good computer for Heavy Word Processing, Heavy Spreadsheeting, Advanced Programming, High-level Data Base Management, Heavy Personal Productivity, and Lengthy Telecommunications. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Excellent. *Portability:* Transportable.

Corona Portable PC

Corona Data Systems, 31324 Via Colinas, Suite 110, Westlake Village, CA 91361. (213) 991–1144 or (800) 621–6746.

Features *Size:* 18¾″ wide, 19¾″ deep, 9½″ high; weight 28 lbs. *Display:* 9″ green CRT, 25 lines of 80 chars; 640×325 pixel graphics resolution. *Keyboard:* IBM-compatible; detachable, 6′ cable; 83 keys including 10 function keys and numeric keypad. *Processor:* 8088. *RAM:* 128K, expandable to 512K. *Mass storage:* one or two 5¼″ disk drives; 360K capacity per drive. *Interfaces:* RS-232 serial port, parallel port, four IBM-PC-compatible internal expansion slots. *Software:* MS-DOS operating system, GW BASIC, Multimate word processor, PC Tutor training package. *List price:* $2545 (one disk drive), $2945 (two disk drives). *Options:* Memory expansion (128K increments), $295; external Winchester hard disk (price not available).

Quality The Corona seems to be a rugged, well-built computer. It is housed in a solid, high-impact plastic case, which is reinforced with vertical metal supports inside. The monitor is quite clear—as clear as any green 9″ monitor we've seen on a portable—with sharp, almost elegant looking char-

acters. The keyboard is the same one as is used on Corona's desktop PC, so instead of having built-in latches that hold it to the front of the computer, it fits inside a removable cover that latches to the case. The cover gives you room to store a few floppy disks, which is nice.

Operation and Friendliness The unit we tested performed flawlessly, but there were several points of minor annoyance. The keyboard is laid out identically to that of the IBM PC, which means you have the same problems with the "shift" key and "return" key locations and sizes. Unlike the IBM keyboard, though, this one has a soft, spongy feel that will cause more than a few erroneous characters when you brush against keys by mistake. To its credit, the Corona's keyboard features LED indicators for the "caps lock" and "num lock" keys to show when they're engaged—something IBM overlooked. The keyboard is connected to the computer with a 6' cord, which attaches to the front of the computer, a logical location that we regret isn't more widely favored in the industry. We found both disk drives quite noisy—enough to cause a minor disturbance in a crowded office whenever you access a disk—and the fan is no whispering zephyr either.

Software Aside from MS-DOS and the BASIC, the only programs supplied with the Corona are PC Tutor (a Corona tutorial) and Multimate, which is the latest rage among powerful word processing programs for PC compatibles. For a long time now, users have sought a worthy alternative to the ubiquitous EasyWriter, and many say this is it.

The program offers a menu-driven structure for those who need it, yet can be operated through direct commands for those who know the ropes. It is divided into seven basic functions on its main menu: edit an old document, create a new document, print the current document, printer control utilities, merge print, document handling utilities, and other utilities. All editing functions are handled through either the edit or create modes, and there are plenty of functions to keep track of. Along with the usual *Insert*, *Delete*, *Move*, and *Copy* commands, this program handles multiple-line headers and footers, easy column formatting and manipulation, centering, justification, and form letter generation, all with relative ease.

Naturally, you'd expect that with so many bells and whistles, this program would have a lot of multiple-keystroke

commands, and you're right. Our only complaint about this program is that the assignment of various commands to function keys or shift/control-key combinations seems almost arbitrary; almost nothing makes sense mnemonically. Centering, for example, is accomplished by hitting "F3," but if you hit "control-F3," you will calculate column sums horizontally. Logical, eh?

Nonetheless the program has some nice features usually reserved for dedicated word processors, like the ability to switch quickly from one document to the next (this is a two-keystroke command here), selecting text to be edited by highlighting it with the cursor keys, and saving text automatically to a backup file after each page. There is also an extensive on-line help facility that gives you instructions about most major program operations and is only a two-keystroke command away. Multimate probably isn't the world's answer to microcomputer word processing, but you could certainly do worse. It will be a fast, easy-to-use product once you get up on it, and the tutorial will help get you there quickly.

The PC Tutor diskette is actually pretty useful. Corona could have taken the easy way out here and simply transferred its written manual verbatim to the screen, but it didn't. This is a thoughtful, helpful program that can take you from utter ignorance to reasonable competence within an hour or two, and that's saying something for an MS-DOS computer. Corona has taken the trouble to load MS-DOS right onto the Tutor disk, so you can just stick the one disk in the computer,turn it on, and take off. You choose topics from a menu that offers everything from basic computer concepts (the monitor is connected to the computer, etc.) to advanced DOS commands and utility programs. You learn the all-important disk formatting and copying procedures, how to handle diskettes, how to name files, and how to run other programs. Basically, this disk gets you from nowhere to knowing how to use other software, even if you've never run a computer before. Our hats are off to Corona on this one.

Documentation The Corona Portable PC is supplied with three manuals: A combination User's Guide and MS-DOS manual, a Multimate manual, and a GW BASIC manual. The User's Guide portion of the first manual is well-written but fairly skimpy, occupying only sixty-two of the 275 pages in

the volume. It is essentially an overview of the system, including: a description of all the ports, controls, and other features; a list of options available for the unit; a setup guide; a brief operation guide, and an introduction to MS-DOS that shows how to set the time and date. The back of this section contains a glossary of terms.

The MS-DOS portion of the manual is really quite thorough. It explains the basic concepts of the DOS, covers all the commands, offers separate chapters on *Edlin, Debug, Filcom,* and hard disk commands, and finishes up with some ideas about data security and an explanation of error messages you can expect from DOS. We found this manual clear and easy to follow.

The manual for Multimate is about 275 pages long, too. Significantly, nearly one-fourth of this is devoted to a thorough tutorial that walks you through the program and lets you try out all its major functions, from simple editing to file management to document merging. Multimate is a powerful program, and this manual handles explaining it fairly well. Aside from the tutorial, you get an overview of how the program works and what it does, how to format data disks and make backup copies, and (after the tutorial segment) a section on the utility functions like document handling and merge print. After this, there's a 125-page reference section and a troubleshooting appendix. A reasonably accurate index is your key to it all. Overall, this manual is a good example of the balance technical writers try to strike between a reference manual and a "cookbook" that gets you going in a hurry.

The GW BASIC manual is not the one supplied by Microsoft. Corona has rewritten it so that the explanations of the various features of the program are far more understandable. This is a manual that explains how to use this version of BASIC with the Corona PC. It makes no attempt to teach you how to program beyond explaining functions individually. Still, it explains the program well and won't lead you astray if you've got a tutorial in one hand and this book in the other. The index and alphabetic listing of statements, commands, functions, and variables are helpful organizing devices.

Reputation/Reliability Corona has been manufacturing add-on hard disk drives for a few years now and entered the

computer business early in 1983. Their computers have been slow in coming to market, which could mean anything from last-minute design problems to a shortage of needed parts. We heard that the portable, which was announced in spring 1983, and didn't make it out until early 1984, was held up because there was a delay in getting the plastic cases for it.

Corona's hard disks have a good reputation for reliability. The Portable PC comes with a ninety-day parts and labor warranty. Service is available through Corona dealers. Service is also available through Xerox computer centers.

Claim to Fame At $2945, including word processing software, two disk drives, four internal expansion slots, and an excellent monitor, the Corona is a good deal. The four slots allow the memory to be expanded internally to 512K and still leave room for a modem or clock card. The unit is reported to be very compatible with existing IBM software.

Best Idea Four expansion slots and two disk drives for under $3000.

Worst Idea Disk drives that sound like a garbage disposal with a fork in it.

Comments At about $700 less than a comparably-equipped IBM PC and $500 less than a Compaq without software, this computer is worth a good, hard look. We suggest you sit down with Multimate and see how you like it, listen to the disk drives (who knows—maybe they'll have fixed them by then), and tickle the keyboard to see how it feels to you. This computer is certainly a contender.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, High-level Data Base Management, Advanced Programming, Lengthy Telecommunications, and Heavy Personal Productivity. *Software Availability:* Excellent. *Ease of Use:* Good. *Compatibility:* Excellent. *Portability:* Transportable.

Hyperion

Bytec/Dynalogic, 8 Colonnade Road, Ottawa, Canada, K2E7M6. (613) 226–7013. Also sold as: AJ PC/530, Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, CA 95131. (408) 263–8520.

NOTE: This computer is manufactured by Dynalogic and

sold by them as the Hyperion. It is also sold as the AJ PC/530 by Anderson Jacobson. The Hyperion and the AJ PC/530 are identical. Pricing and hardware and software options differ for the two, however. Both computers perform identically, but we have pointed out in the review different software options, service policies, and optional documentation or other products scheduled for future introduction by the different companies.

Features *Size:* 18¼″ wide, 11¼″ deep, 8¾″ high; weight 21 lbs. *Display:* 7″ amber-colored CRT with separate brightness and contrast controls on front of unit; 25 lines of 80 chars; 640 × 250 pixel graphics resolution; display automatically shuts off after five minutes without use to save power. *Keyboard:* detachable, 4′ cord; 84 full-sized keys, including 10 programmable function keys and separate numeric keypad; 256 different characters, including foreign language characters, line drawing symbols, and mathematical symbols; compatible with IBM PC keyboard layout (although not identical); stows underneath main unit when not in use. *Processor:* Intel 8088. *RAM:* 256K, expansion not currently available, although an expansion chassis is planned for future release; additional 20K RAM for the display. *Mass storage:* (depending on configuration purchased) one or two 5¼″ double-density, double-sided disk drives, 360K capacity per drive. *Interfaces:* external monitor port, parallel port, RS-232 serial port; proprietary expansion interface, direct-connect and acoustic-coupled modem interfaces; AC power input. *Software:* (depending on configuration purchased) MS-DOS operating system, version 2.0; ALADIN relational data base, ALADIN Statistical Pack, ALADIN Calculator Pack, Microsoft Advanced Disk BASICA, Multiplan spreadsheet, IN:SCRIBE text editor, IN:TOUCH communications program. *Other features:* built-in clock/calendar with battery backup; programmable sound capability. *Options:* Intel 8087 floating point arithmetic processor; internal, direct-connect, auto-dial/auto-answer, 300 baud modem; padded vinyl carrying case; Lotus 1-2-3 integrated software package. *List prices:* Dynalogic Hyperion: $3195, includes one disk drive, MS-DOS operating system, Microsoft Advanced Disk BASICA, ALADIN data base, one-year warranty. *Option prices:* second disk drive, $495; 8087 processor; carrying case, $65; IN:SCRIBE, $155; IN:TOUCH, $395; Multiplan, $250; Lotus 1-2-3, $495.

Anderson Jacobson Model 530-1: $3195, includes one disk drive, MS-DOS, Microsoft Advanced Disk BASICA, and ALA-DIN software packages.

Anderson Jacobson Model 530-2: $3690, includes two disk drives and same software as Model 530-1.

Anderson Jacobson Model 530-3: $4555, includes Model 530-2 features plus built-in, auto-dial/auto-answer, 300 baud modem, soft travel carrying case, Multiplan, IN:SCRIBE, and IN:TOUCH software packages.

Quality This computer appears well-made. All the seams fit together well, and we were unable to detect any bowed or weak spots in the outer casing. The keyboard is extremely lightweight, which makes us wonder about how much it will



Photo 6-5. **Hyperion.**

slide around on a desktop under hard typing. The two "feet" that pop up underneath the keyboard to hold it at an angle don't lock into place, and seem likely to fold up fairly easily. The keys have a slightly spongy feel, but responded well.

The amber-colored display is quite clear. The internal fan was very quiet. As to ruggedness, this computer is designed more to be carried from one desk to another than from one airport to another. The handle is built-in to the top of the computer, and the keyboard—rather than covering the disk drives and monitor—slides into a storage tray underneath them, so that when the unit is carried by the handle the display screen and disk drives are fully exposed.

One feature that promises added ruggedness is that the disk drive heads lock apart (there are two opposing heads on double-sided drives) when there are no disks in them, so the chances of the heads being slammed against each other during travel is practically eliminated. There is a padded vinyl case you can slip the whole computer into, but it's a $65 option unless you buy the top-of-the-line configuration from Anderson Jacobson.

Operation and Friendliness The software supplied with the Hyperion/PC 530 makes excellent use of the keyboard's 10 function keys. In almost all of the programs supplied for this computer, these keys are used extensively to perform what would normally be multiple-keystroke commands, whether it's editing in the text processor, BASIC commands, search or dial-up commands in the communications program, or others. The exception to this is Multiplan, which works the same way it works on other computers. Apparently Dynalogic and Anderson Jacobson felt that Multiplan was simple enough to use as it was without going to the trouble to make it work through the Hyperion's function keys.

One function key, "10," is always dedicated to the *Help* function, which explains the main commands for the program you have loaded at the time. The labels for the function keys change according to where you are in the program you're using. The labels are displayed in a bar at the bottom of the screen, five on one side and five on the other, with a space in the middle. The space is used to display the current time and to show whether the "caps lock" or "num lock" key is engaged (a nice feature).

In addition to the *Help* file, there is an *Explain* command that offers helpful information in a different way. While the *Help* key will provide information about the specific key labels that are currently displayed on the screen, the *Explain* function offers a sort of random access help file, and will provide information about any DOS, text editor, or communications program command when you ask for it. The Hyperion/PC 530 creates a drive C out of a section of the computer's RAM to supplement the computer's two disk drives. It is set to a default capacity of 90K, but you can vary it with a DOS command to occupy from 0K to 160K of the memory. This "third disk" is used to store often-used portions of the DOS, and to act as a sort of file manager for the other two disk drives. For example, when you boot MS-DOS, part of it is stored in drive C, and your currently logged drive is listed as C. At that point, the function key labels allow you to select the text editor, the communications program, or Multiplan. Assuming you have the appropriate program disks in the other two disk drives, you can hit one of these soft keys and drive C will find the file you want to access, no matter which drive it's located on. This avoids your having to switch drives manually by entering a DOS command.

For a computer of this power and versatility, the Hyperion is very easy to use, particularly if you're using the Dynalogic-developed IN:SCRIBE or IN:TOUCH, which were written with the function keys in mind. In normal use, you wouldn't have to remember a single program command for these packages, because all functions are handled through clearly labeled function keys.

On the compatibility issue, the Hyperion is not—and doesn't claim to be—totally IBM-compatible. It will read some IBM software but doesn't have an identical keyboard (which we consider a plus), and won't accept IBM add-in boards. So you're pretty much left with the options and software offered by the manufacturer or Anderson Jacobson.

Software IN:SCRIBE is a reasonably complete text editor. It doesn't have all the functions of the most powerful editors, such as proportional spacing, centering, headers and footers, and automatic page numbering, but it makes up for not having everything in the world by being very easy to use. It's billed as a "productive tool for the busy professional," with the assumption being that busy professionals are mostly in-

terested in creating memos and brief reports quickly, rather than in having a lot of formatting options.

The Hyperion/PC 530's function keys control all of the basic editing functions: switching from insert mode to overstrike; defining, moving, copying, or deleting blocks of text; changing the margins; breaking pages; or splitting files, to name a few. This is a screen-oriented editor, which means that what you see on the screen is what you get. The margin areas are displayed in shaded video, and page breaks are shown with dotted lines. The editor has all the most desirable features, such as automatic word wrap, search and replace, and block manipulation. There is no spelling checker, and no list merging function, though.

There are function keys that allow you to change type fonts, or make characters display in reverse video, underlined, boldface, blinking, subscript, or superscript. Along with the soft key labels displayed at the bottom of the screen, there's a status line at the top of the screen that shows you what line and page you're on. Moving around the document is possible through soft keys by either word, character, line, screen, page, or beginning or end of the document.

Another nice feature that many word processors offer but that is made very easy to use here is the ability to define "wildcard" characters. Called MYKEY on the Hyperion, this function allows you to assign strings of up to 200 characters to a single key, and then insert them in text with one keystroke. So, for example, if you were creating a document that repeatedly used the phrase, "gorilla romance in Nepal," you could assign that string to one function key and insert it at the touch of that key whenever you wanted. You can define up to 8 different function keys with their own character strings for this purpose.

The annoying part about IN:SCRIBE is that with all the handy function key commands, there's no *Print* command. If you want to print a file, you have to exit IN:SCRIBE and issue a *Print* or *Copy* command from DOS. This is a very cumbersome way to print documents, and frankly we're at a loss to determine why Dynalogic chose to omit this basic command from the text program itself, unless they assumed that most busy professionals wanted to create disk files rather than printed copy.

IN:TOUCH is the Hyperion's telecommunications pro-

gram. Again, this works exclusively through function keys. Main features of this program are the ability to build and store a dialer file, which can contain several hundred names and telephone numbers in alphabetical order. These individual names and numbers can then be easily accessed for automatic dialing. IN:TOUCH and IN:SCRIBE are supplied on the same master diskette, but if you copy IN:SCRIBE to its own diskette, you can store about 3,000 dialer file entries (names and telephone numbers only) on the IN:TOUCH program diskette, which is more than anybody would ever need. In addition to the dialer file, you can store up to ten "speed-dialer" numbers under each of four function keys. Hitting one of these keys will display a menu of ten numbers listed opposite individual soft keys. You select which of the ten entries you want by hitting the soft key assigned to it. It would be hard to make automatic dialing easier than it is with this program. You can also dial numbers directly from the keyboard. Speaker volume can be adjusted with a function key.

Another nice feature that we'd like to see widely imitated in communications programs is IN:TOUCH's elapsed-time monitor. It's a clock that starts when you begin dialing a call and stops when you disconnect, so you can watch your pennies on long distance calls. A "data" key lets you send and receive data, with separate keys to upload and download files based on the standard IBM PC communications protocol, or a different modem protocol that you can specify. The program can also store log-on sequences to utilities or host computers. This is done simply by pressing the "learn" function key before entering a sequence, and the "stop" function key after finishing it. Being able to store log-on routines for information utilities like The Source or Dow Jones News/Retrieval will save you having to dial a phone number and then enter a system number, user ID, and password every time you want to call them. With the stored routines, you just hit one key and all the rest is done for you.

Multiplan is the spreadsheet that comes with this computer, and we feel it is a good choice. It has displaced VisiCalc as the best selling spreadsheet program on several best-seller lists and has received almost universally excellent reviews from computer magazines. There are a lot of reasons for this.

One big advantage of Multiplan is that it's easier to use than most other spreadsheets, and yet doesn't sacrifice performance in the bargain. There are twenty basic commands by which Multiplan operates, and they're displayed in a group at the bottom of the screen almost all the time. You need only type the first letter of a command to perform it.

While Multiplan is as large as most other spreadsheets (255 rows by 63 columns), it makes it easier for you to work with such a large area when you move from one part of the sheet to another. Since most people put the row and column labels on the left-hand side and top of their spreadsheets, it might be easy to move to a part of the spreadsheet where the labels weren't visible (because the screen will display only a small part of the total worksheet at once), but Multiplan allows you to lock the labels on the screen, so that while the rows and columns scroll by, the labels are always visible.

As with most other worksheets, the row and column location of your cursor is always displayed on the screen, as is the amount of memory space available (expressed here as a percentage of the maximum rather than the number of kilobytes), and the name of the file you're working on. Another nice feature is the ability to split the screen and have two portions of the worksheet scrolling in synch. This makes it easy to compare figures in one section with those in another.

Multiplan makes it very easy to copy figures from other worksheets onto the worksheet you currently have loaded. Besides their row and column numbers, individual cells can be assigned names, so you can refer to them by name rather than having to remember specific locations. If you finish a worksheet and realize you've left off a whole row of numbers, you can easily insert a blank row into an existing set of data.

Many of these features don't really mean much if you've never used a spreadsheet, but the excellent tutorial and reference manual for Multiplan will have you using this program effectively in a relatively short time. The tutorial section covers about half of the manual, and takes you through all the movement, data entry and manipulation, calculation, formatting, and copying commands in an extremely thorough fashion. There are lots of screen diagrams that show

exactly what your screen should look like at various points, and there are sample exercises to get you familiar with the program's functions.

Once you've finished the tutorial, more help is available not only in the manual's reference section, but also through an on-screen *Help* file, which contains about fifty pages of condensed explanations from the manual. The *Help* file is keyed to your position in the program, so that if you ask for help when formatting, you'll bring up that section of the file. You can also scroll through the entire *Help* file to refer to other sections, if you like.

Dynalogic is currently having an independent software house create the line of ALADIN software, which includes a statistical pack, a data base manager, and a calculator pack. We can't comment on these programs, as they weren't available for review when this evaluation was done.

Optional Software Anderson Jacobson is also configuring Lotus 1-2-3 for the Hyperion and will offer it as an option. Again, the Hyperion version of this package wasn't available at the time of our evaluation, but Lotus 1-2-3 has been extremely popular with 16-bit computer owners, particularly those in large corporations, because of its integrated spreadsheeting, graphics, and data base management capabilities.

Documentation The basic unit comes with three manuals: a Setup Guide, a User Guide, and a Programmer Guide, all of which are supplied by Dynalogic. Anderson Jacobson is developing a new user's manual of its own, which it hopes will be more complete than Dynalogic's, but the manual wasn't available in time for this review.

The User Guide is a seventy-five-page, spiral-bound booklet with index tabs separating the introduction, unpacking, startup, tutorial, and quick reference sections. The Guide basically gets your system out of its packing box and up and running. However, the quick reference section includes descriptions of the function key designations for all of the Hyperion's software, and thus will be helpful in later use as well. The Setup Guide is very clear and easy to follow, and should have a new user fairly comfortable with the system inside of an hour.

The User Guide is bound in a three-ring binder and slipcase. It describes in considerable detail the general use of the Hyperion, the specific uses of DOS, IN:SCRIBE, and

IN:TOUCH, and finishes with a brief section on advanced DOS functions and a short and skimpy index. The use of Multiplan, if it comes with your configuration, is covered in a separate, ring-bound manual.

The User Guide is very straightforward. It offers step-by-step instructions that cover all the features of IN:SCRIBE and IN:TOUCH and most of the functions you would ever need for DOS. IN:SCRIBE and IN:TOUCH are fairly simple, limited programs that are very easy to use, so the manual's job is made easier by the programs in this case. Nevertheless, the sections on these applications include sample screens, complete descriptions of the function key options at various program points, potential error messages, and warnings about error-causing situations. There are no exercises to help you practice your use of these applications, but the step-by-step instructions are so clear that they can be used to practice with.

The problem with manuals of this type is that they tend to place structure and step-by-step format above completeness, and that is the case here. The manual is designed for use as a walk-through tutorial, rather than a reference guide. If you follow the steps a page at a time, you'll have pretty good luck. But if you want to skip around, it is difficult, at times, to find the information you want. In addition, the manual is often more concerned with moving along to the next step in a particular process than it is with fully explaining all the implications of a particular step. You find yourself with a lot of unanswered questions if you stray from the course of action laid out for you. Nevertheless, the course of action is fairly comprehensive, and access to information is made somewhat easier by an alphabetical listing of all commands for each program and the pages on which they're discussed. This is a particularly useful feature here, since the index for the manual is very sketchy.

The third manual is a 500-page Programmer's Guide, which covers not only the use of BASIC but also of Microsoft's MACRO Assembler. The manual's sections cover some programming techniques as well as offering complete explanations of program commands, statements, and functions. The BASIC commands are listed alphabetically, which makes them a little easier to refer to, but an index would have been even better, and there isn't one.

Reputation/Reliability Dynalogic is a Canadian firm that has been in the floppy diskette and Winchester hard disk business for about ten years. Bytec Management, the parent company, is a very solid firm that operates several successful enterprises in Canada and around the world. The Hyperion is their first microcomputer system. It was announced in mid-1982 but wasn't shipped to customers until about a year later. It carries a ninety-day parts and labor warranty, and may be serviced through Hyperion dealers.

Anderson Jacobson, founded in 1967, is a worldwide distributor of data processing equipment to large corporations. The company makes most of its own products and sells them on a fairly large scale to an important group of clients. Some of Anderson Jacobson's other products include printers, mainframe computer terminals, high-speed modems, disk drives, and electronic typewriters. Anderson Jacobson's claim to fame is its large sales and service organization, which offers on-site service, training, and applications development for its customers. If Anderson Jacobson installs your PC 530 and you're within fifty miles of an AJ office, the company will provide on-site service. AJ has offices in one hundred major metropolitan areas in the United States, and has subsidiaries in Canada, France, Germany, and Great Britain.

Claim to Fame The Hyperion's claim to fame, we feel, is its ease of use. The excellent use of the function keys to drive many of its programs as well as the myriad *Help* and *Explain* functions make it very simple for the proverbial "executive on the go" to learn in a minimum amount of time. At 20 pounds, it is, next to the Otrona Attaché, the smallest and lightest of the full-featured PC compatibles.

Best Idea This would have to be the use of the function keys in IN:SCRIBE and IN:TOUCH and the on-screen key labels. This is about as close as you can get to programs that explain themselves without a manual, short of on-screen icons, touch screens, and other advanced technology.

Worst Idea Designing the carrying handle and keyboard storage so the monitor and disk drives aren't protected when you move the computer about. This, coupled with the company's miserly failure to include the carrying case as standard equipment, makes for an unusual lack of protection for a portable computer.

Conclusion The Hyperion isn't the cheapest of the PC com-

patibles, especially since so many features that are standard on many competitive products (like applications software and a carrying case) are options. Nevertheless, it is much easier to learn quickly than its competition.

Ratings This computer is suitable for: Casual Word Processing, Casual Spreadsheeting, High-level Data Base Management, Simple Programming, Lengthy Telecommunications, and Heavy Personal Productivity. *Software Availability:* Fair. *Ease of Use:* Excellent. *Compatibility:* Fair. *Portability:* Transportable.

The Jonos C2100

Jonos Corporation, 920-C E. Orangethorpe, Anaheim, CA 92801. (714) 871–1082.

Features *Size:* 17″ wide, 13″ deep, 7″ high; weight 25 lbs., weatherproof aluminum case. *Display:* 9″ green CRT, 25 lines of 80 chars., selectable video attributes. *Keyboard:* detachable, Selectric-style; 92 sculptured keys including numeric keypad, cursor arrow keys in line, 10 function keys, large backspace key. *Processor:* Z80A, *RAM:* 64K; 8-slot STD bus card cage with 5 card slots open for expansion. *Mass storage:* two Sony $3\frac{1}{2}$″ microfloppy drives, 322K capacity per drive; room for a third drive. *Interfaces:* two RS-232C serial ports. *Software:* CP/M 2.2, Spellbinder word processor, Spellcheck, BASIC-80, Multiplan spreadsheet program. *List price:* $3195. *Upgrades:* Model C2100 available with 640K or 1.2 MB $5\frac{1}{4}$″ drives starting at $3495. Model C2150 uses the faster 6 MHz Z80B CPU, CP/M Plus and 128K bank-switched RAM, your choice of $5\frac{1}{4}$″ or Sony $3\frac{1}{2}$″ drives, starting at $3695. Model C2500 is the same as the Model 2150 except that it uses two hard disks: one fixed, one removable, both 3.9″ in size and 5 megabytes (MB) in capacity, $5995. Model 2600 substitutes one fixed 10MB hard disk and one Sony $3\frac{1}{2}$″ microdrive, fan, also $5995. *Options:* 320K disk emulation card, $795; graphics display controller card (620 × 240 pixels), $495, or 8 colors, $695; 300/1200 baud modem card, $695; dot-matrix printer attaches to back, speed 50 characters per second, weight 9 lbs., $595; leather carrying case, $300. Removable hard disk expansion, external hard disk expansion, 8″ disk expansion, and extensive list of STD bus cards are available.

Quality The Jonos line of transportables, built into thick aluminum cases, appear solid and well made, with doubled-up snaps to close them, padded handles, keyboards with a rock-steady touch, and quality Sony drives.

Their distinctive appearance is from the fact that they open front and rear. The keyboard is in the front, and also contains the handle, making the Jonos the only transportable to be carried by its keyboard (the reason for the massive pivots). In the back is a cover that holds the cords during transport and opens to reveal the interface plugs as well as the STD bus card cage. This is not a "cute" computer, but one that looks like it means business.

Operation and Friendliness The Jonos is a typical CP/M transportable in its operation. The screen is large (9") and clear. The Sony drives are very convenient because you just stick the disks in and the drive opens the special protective disk cover slot automatically. The sliding disk cover makes one feel more secure about one's disk data, and a slot below the disk drives is large enough to carry a dozen spare disks, which is handy.

The machine opens up and snaps shut quickly and easily. The power switch, contrast knob, and reset buttons are on the front, where they belong, but recessed out of harm's way.

The keyboard handle folds over to prop up the keyboard to the correct angle for use. The keyboard is very Selectric-like, with no nasty surprises: the "return," "shift," "tab," and "shift lock" keys are large and right where you expect them, and as a bonus, the "back space" key is extra large. The only eccentricity about this keyboard is the "control" key, which is down next to the spacebar, an awkward location, especially for word processing. It should be swapped with the "function" key. In fact, the salesman who demonstrated the machine had rewired his, and the result was much more satisfying.

When it comes to disk access, this is hands down the fastest computer we have ever seen. Calls to the disk take a fraction of the time required on a normal CP/M computer. DIR, the CP/M directory listing command, is all but instantaneous. PIP, an 8K file, takes well under a second to load compared to just under two seconds on most 8-bit computers. MBASIC, which is 24K and takes almost seven seconds to load on most machines, loads in about two seconds

on the Jonos. It's not the Sony drives: they're not usually any faster than 5¼" drives. Jonos has optimized the operating system somehow. This talk of seconds may not impress you now, but when you've used a computer for a few years, the difference between a two-second MBASIC and a seven-second MBASIC will raise your eyebrows too.

Jonos is one of the few CP/M transportables with a card cage, so you can expand by adding computer cards internally. In this case the card cage uses the STD bus standard (like the M6000P Voyager), for which some 750 add-on cards are available to expand memory, attach disk drives of various sizes, and expand your computing power. The STD bus is used mostly by engineers and technical people, however. The S100 bus standard, used on the Star-Lite, is more business oriented.

Software Jonos offers you CP/M 2.2 (or the more advanced CP/M 3 with one of the upgrade models, so you can handle larger RAM). You also get Spellbinder, a very interesting little word processing program.

Often overlooked in discussions of word processors, Spellbinder is a formatter/editor word processor similar to many others, with a sufficiently full range of WP powers that it need take a back seat to nobody. But Spellbinder's particular claim to fame is print formatting.

Spellbinder is widely known as the most powerful printing program in the world. As you may know, printers are cantankerous beasts with many peculiar and individual capabilities, which are invariably hidden in the bowels of the printer, inaccessible to the ordinary word processing program. Some printers can scroll backwards, create graphics (even letter-quality printers), perform fancy overprinting and underlining, and print proportional characters, so the printout looks like a book. But getting the word processor to drive those printers is the devil's own work.

That's where Spellbinder shines. They say it can make any printer anywhere do anything. If you need typeset quality printout, Spellbinder will do it better than anyone. If you just bought a $4000 Sanders dot-matrix printer which has twelve fonts in six sizes with horrific control code sequences demanded for each one, Spellbinder doesn't even turn a hair; it's got that Sanders jumping through hoops in no time.

Yes, Spellbinder is a whiz at printing; as a word proc-

essor, it's no slouch either. All in all, a good choice, a fair competitor for WordStar, and better than Perfect Writer. We rate it suitable for heavy word processing.

Also included: Spellcheck, the spelling checker from the Spellbinder people; BASIC-80, very similar to MBASIC; and Multiplan, a much-admired program of the third generation of spreadsheets (like SuperCalc2 and VisiCalc Advanced Version). Multiplan is another superior choice by Jonos, making it suitable for heavy spreadsheet work.

Reputation/Reliability Jonos offers a one year warranty on the keyboard, the card cage, and the parts they make inside, the longest warranty we've seen. The warranty in the tube and the disk drives is ninety days. Maintenance at the moment is through the factory, but Jonos is setting up a nationwide maintenance network with Western Union. Jonos Corporation makes point-of-sale computers (ones used for cash registers) and has been in business for about three years. Their portable computers have not been widely distributed and so we cannot comment on long-term reliability. There's certainly been time to iron out the bugs. Jonos is no recent arrival on the computer scene. The STD standard and Sony drives suggest a devotion to standard components that make one more confident in the hardware's reliability.

Claim to Fame There are only three CP/M machines that include expandable card cages, and this is one of them. That means the computer is protected against early obsolescence.

Best Idea Clearly, the STD bus card cage.

Worst Idea The attachable dot-matrix printer, which brings the computer to around 40 pounds and adds 4″ to its depth. It would be easier to put an Epson in a separate carrying case.

Comments This is a solid machine with convenient $3\frac{1}{2}$″ drives. The 5MB-fixed/5MB-removable hard disk option is interesting for those with several large data manipulation projects who are worried about filling up a regular fixed 10MB or 20MB hard disk too quickly. The company is small and has been plugging away for quite some time, but the standardized bus arrangement protects the buyer should the company take a dive, because the machine can be easily serviced and easily upgraded with changing needs. As with other expandable computers, you pay extra for the expandability; there are cheaper machines if your requirements are more modest.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, High-level Data Base Management (particularly with hard disk combinations), Advanced Programming (especially because of the STD bus), Lengthy Telecommunications, and Heavy Personal Productivity. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Excellent. *Portability:* Transportable.

Kaypro II, 4, and 10

NonLinear Systems, Inc., 533 Stevens Avenue, Solana Beach, CA 92075. (619) 755–1134.

Features *Size:* 15″ wide, 18″ deep, 8½″ high; weight 26 lbs. *Display:* high-resolution 9″ green CRT, 24 lines of 80 chars. *Keyboard:* detachable, Selectric-style; 72 keys plus 14-key pad, 20 programmable function keys, cursor keys in a line, delete key, backspace key, lighted caps lock key. *Processor:* Z80A *RAM:* 64K, not expandable. *Mass storage:* two 5¼″ disk drives, 185K capacity per drive. *Interfaces:* RS-232C serial port, Centronics-type parallel port. *Software:* CP/M 2.2; Microsoft BASIC-80 with a dozen "freeware" games; "Uniform" program to read and format disks in Osborne, Xerox 820, TRS-80 Model I formats; The Word Plus (speller); ProfitPlan calc program; and buyer's choice of the Perfect Software package (Perfect Writer, Perfect Speller, Perfect Calc, and Perfect Filer) or WordStar (without MailMerge). *List price:* $1295. *Upgrades:* Kaypro 4 provides an improved CRT; double-sided, double-density 5¼″ drives, 384K capacity per drive; and a built-in modem. Built-in 300 baud modem and Suprterm [sic] software to run it; battery operated internal clock. *Software:* add SBASIC, CBASIC programming languages. *List price:* $1995. Kaypro 10 is hard disk model; internal 8.9 megabyte (MB) Winchester hard disk (formatted), plus one 5¼″ double-sided disk drive, 384K capacity; weight: 31 lbs.; add a second RS-232C serial port; includes Kaypro 4 software, plus dBase II advanced data base program and its tutorial. All software loaded onto the hard disk. *List price:* $2795. *Options:* An 8088 co-processor is available that will run many MS-DOS-compatible IBM PC programs. A networking system that links Kaypro 10s, together is also available.

Quality The Kaypro II appears solid, being housed in steel rather than in the usual computer plastic. There is no fan,



Photo 6-6. Kaypro II.

but the metal container has slots in the side, back, and bottom, so it dissipates heat well. The disk drives are noisy but shut off immediately after each access, leaving the unit extremely quiet.

There were rumors of machine failure in Kaypro's earlier days, and competitors continue to grouse about Kaypro's hardware quality, yet nothing specific ever develops to back up these complaints. The company seems steadily to improve this product's quality. No particular machine inadequacies are apparent, and the computer is reported able to sustain lots of bumpy traveling. The metal case scratches. On the other hand, the metal case makes the Kaypro one of the lowest radio frequency (RF) emitters on the market (i.e., it doesn't interfere with your neighbor's television set).

Operation and Friendliness This is a standard desktop CP/M computer packaged in a portable steel case, so its operation is identical to that of most other CP/M computers. Friendliness, therefore, is tied primarily to its software, since the computer itself does not get in the way of the user.

Currently the software includes CP/M 2.2, a disk format program that lets you read disks from other computers (a tremendous plus), a BASIC, one of the best spelling checker programs on the market, and a calc program. In addition, you get your choice of WordStar, or the entire Perfect Software lineup: Perfect Writer, Calc, Speller, and Filer. Since WordStar is the best selling word processor, and Perfect the most widely bundled program line, it's an interesting head-to-head matchup. You can see our detailed opinion of how these two groups compare in the Appendix.

In short, WordStar is a superior, powerful, and occasionally intimidating program that will last a lifetime. But we strongly recommend you also buy the MailMerge companion program Kaypro will offer you for an additional $50; you'll need it to make full use of WordStar's power. Perfect Writer is less than perfect, though a fully professional word processor with a complete line of capabilities—even if the control codes are inconvenient and hard to learn. Perfect Calc is somewhat awkward, and Perfect Speller redundant since you already get the best speller on the market, The Word Plus. Perfect Filer, a straightforward and easy to use file management program, is the program that will be missed if WordStar is chosen. (As we go to press, Kaypro has announced that it is dropping the Perfect line and substituting Micropro's WordStar, CalcStar, and SpellStar.)

The Kaypro keyboard is solid, with deeply sculpted standard Selectric keys and a somewhat stiff feel. Separate arrow keys for cursor movement are in a straight line—bad—but separate from the rest of the keyboard—good. A separate "delete" key makes corrections easy. Excess keys are placed out of the way beyond the "return" key. The keypad can also be set up as a function keypad, although the program to do so is difficult for the beginner. Only three complaints. First, the "caps lock" key is too easily activated by accident when reaching for the "control" key—this is the most common key placement error in the computer business at the moment. Second, the keyboard connector, a standard telephone cord, must be inconveniently detached at both ends to pack up the machine. And third, the Kaypro uses an up arrow symbol on screen instead of the industry standard caret (^) to indicate control characters. In fact, even the caret on the keyboard,

above the number "6," generates an up arrow symbol on the screen—yet the regular caret shows up on the printer. This may cause confusion to new users.

Power and reset buttons are on the back, an awkward reach. The front is clean and simple, with just the large, crisp, green screen, two disk drives, and a power light. The disk drive light stays on to show which disk drive is logged in. The disk drives are noisy, but where most computers let the drives run for a few seconds to save disk access time, the Kaypro's drives stop dead the moment they are done, even before the information has hit the screen. This, together with the lack of a fan, make the Kaypro more than usually quiet.

The only problem with the large, clear display is the character font. The descenders for the g, y, p, and q characters are not true descenders and look peculiar.

This is a CP/M machine, with all that implies. The operating system is not particularly cozy, but is efficient once you get the hang of it. While the operating system loads as soon as the disk is inserted, there is no automatic software loading routine, so you have to type in the (short) name of the program you want to run. Any "friendliness" is up to the software.

Software Kaypro has tried a lot of different software packages for its bundled software. First there was Select, a simple but inadequate word processor. It was dropped in favor of the Perfect Software line, which is interesting but substantially less than perfect. WordStar is now offered as an alternative, though without MailMerge.

The lineup changes more often than that of a baseball team in a slump. This may indicate confusion at the top, or it may indicate a continuing desire to improve the software and respond to the users. In either case, it's hard to review the Kaypro software because you don't know how long it's going to be around. Fortunately, the current software is popular.

All the Kaypro models come with industry standard CP/M 2.2, in a standard configuration. The Kaypro comes with a program ("Uniform") that lets you format disks for or read disks from the Xerox 820 (which is becoming something of a standard format for 5¼" disks), the Osborne single- or double-density, and the TRS-80 Radio Shack Model I. This gives the Kaypro access to an overwhelming majority of all

5,000 CP/M programs on the market. Only the Osborne and the new Morrow share this highly useful ability.

A variety of BASIC dialects have passed through the Kaypro. BASIC-80, a common version of MBASIC by Microsoft, is current resident. This is a good, solid, standard BASIC similar to Radio Shack's BASIC except for the lack of screen-display commands. This program will support most of the standard software you'll see in the stores. SBASIC, a compiled (i.e., faster) and structured BASIC resembling CBASIC and Pascal, is also available but not recommended except for programmers.

The Word Plus is a top-of-the-line spelling checker which you use to find spelling errors in your text files. It also will offer synonyms and homonyms, decipher anagrams, offer alternate spellings so you don't have to look up a word in the dictionary, take care of hyphenation, and summarize your word usage frequencies. Some of these are offered by other spellers as well, but The Word Plus additionally shows the words in context, and lets you correct them on the spot, instead of having to go back to the word processor. Perfect Speller, an adequate speller included if you choose the Perfect line, has no particular advantages over The Word Plus.

ProfitPlan is a calc program that takes a slightly different approach from the standard established by VisiCalc and SuperCalc. It still displays a typical spreadsheet, but it uses such a quirky, individualistic approach that it's difficult to compare it to SuperCalc or Multiplan. It has the same mathematical and formatting power, and the only complaints might be that its modeling language approach seems slightly cumbersome when compared to SuperCalc, and it lacks SuperCalc's sense of immediacy. It's a program that would appeal more to formalistic, math-oriented users, while SuperCalc is the calc program for the business user who just wants to wing it through a business analysis. Under various names, ProfitPlan is seen in multi-user OEM environments (OEMs are companies that package computer systems under private labels, and sell them as customized business machines).

The rest of the Perfect Software line and WordStar are reviewed in detail in the Appendix. In sum, we prefer WordStar to Perfect Writer, but the Perfect line will function adequately for most buyers, despite its cumbersome command

structure.

The only software program we missed was the freeware program "XDIR" which gives an "extended directory" listing the exact amount of disk space taken up by each program, and the total disk space remaining. Be sure to consult your nearest Kaypro or CP/M users group (ask your dealer) to obtain a free copy of this program. It'll come in handy.

Documentation If the Kaypro has a weak point, this is it. The company suffers from the traditional engineer's "slap some covers on something" approach to user manuals, and it hurts—especially for the Kaypro which is clearly a consumer's (as opposed to a computer techie's) computer. The documentation department is a bad place to try to save money.

What they've done is simply put handsome Kaypro covers on the manuals supplied by the software vendors. The result is generic documentation filled with phrases like "if your machine has arrow keys" and "depending on your exact computer" and never refers to the Kaypro at all. It's a good thing the disks come already configured.

The manuals to The Word Plus, ProfitPlan, and all the Perfect Software programs are quite good, with tutorials and handy quick-reference cards summarizing their (enormous number of) commands. The new WordStar manual is also a gigantic step from the older, legendary manual that was so awful it spawned an entire subindustry of writers explaining the program.

The shortcomings of the slap-a-cover-on-it school of documentation become glaringly evident in the CP/M and BASIC-80 manuals. CP/M glories in the industry's other most infamous user manual: Digital Research's CP/M reference guide. This book is incomprehensible even to computer hackers. It is a dead loss for a beginner, and should carry a warning label: "For experts only!"

The BASIC-80 manual is another horror show, repackaged directly from Microsoft with no introduction, apologia, or tutorial. The manual abandons the BASIC beginner on page one, paragraph three and never looks back. Go to the bookstore and get a tutorial on BASIC programming. Microsoft's manual is so bad it should be in a museum, along with the old WordStar and CP/M 2.2 manuals, with a sign: "The Bad Old Days of Computer Manuals." Personal computer

company management teams would be forced to visit annually and read chapters from each, so they would go home and support their documentation departments—and thus their customers—properly.

To be fair, Kaypro has made some small effort. To salvage CP/M, Kaypro provides a ten-page file on the Perfect Writer disk explaining elementary CP/M commands to beginners, showing how to do such necessary everyday things as copy disks and rename files. That's good. But you've got to stumble across the disk file because nobody tells you it's there. Further, you have to print it out yourself to use it. Heaven help you if you don't own a printer yet. And of course if you choose WordStar instead of Perfect Writer, you're out of luck altogether, because we were unable to find this file on our Kaypro WordStar disk.

Likewise, BASIC is saved by the presence of half a dozen BASIC games like Wumpus, Star Trek and blackjack. A tiny booklet describes the rules of each game, and tells how to load BASIC and run the games. This serves as an introduction to BASIC, and not a bad one, actually. Since you'll mostly be buying off-the-shelf BASIC programs, what you really need to know is how to run such a program in BASIC. Remember that when your boss catches you playing Star Trek, you're really learning BASIC.

Another very short pamphlet introduces you to the machine, shows you where the switches are, and tells you how to operate Kaypro's prize, a special disk formatting program that lets you use disks from other computers.

In short, Kaypro-specific documentation is minimal, so the manuals are only as good as each software vendor has made them. For most of the software, that's good enough. In the case of BASIC and CP/M, it's awful!

Reputation/Reliability The Kaypros have a ninety-day warranty through their dealers, and an arrangement with SORBUS, the nationwide independent repair service, for Kaypro owners traveling far from their dealers.

Some 75,000 Kaypros have been sold in the two years since its release. The Kaypro is a very inexpensive machine with unusually low dealer margins, which doesn't make the dealers happy. Despite this, the Kaypro has been on the market long enough for any hardware problems and machine

failures to show up, and nothing specific has developed. Dealers we've talked to say it's a solid, reliable machine in its price category.

This is true even of the hard-disk Kaypro. It is difficult to understand how a hard disk, which is extremely sensitive to vibration when in operation, can be placed in a portable computer with any sense of confidence. Yet dealers tell us the disks aren't a repair problem. It's true that the disk has a special shutdown routine you're supposed to follow at the end of the day which protects the read/write head from damage while the disk is off. If you disconnect the power cord by accident, you can run a real risk of damage to the hard disk, and good-bye to ten million characters of information.

On the other hand, a Kaypro 10 costs approximately what a 10MB hard disk costs by itself. It's difficult to resist this kind of bargain. If you do go with the Kaypro 10, please take extra care not to drop the computer while it's running.

Kaypro is a division of NonLinear Systems, a high-tech firm that's been in business since the 1950s when it invented the first portable digital voltmeter and the smallest portable field oscilloscope. This existing business funded the Kaypro I and has permitted the orderly rollout of the industry's only complete line of portables. The question is whether the financial and managerial support of NonLinear Systems will enable Kaypro to avoid the high-growth disasters that brought Osborne to its knees.

Claim to Fame Kaypro now has the cheapest full-featured transportable computer (the Pied Piper has only one disk drive and no monitor, and the Osborne 1 is a fire sale item with a small screen). It also has the cheapest full double-sided disk drive system. And it has by far the cheapest hard disk system (and not a piddling 5MB like other people, but a full, brawny 10MB!). Kaypro's real claim to fame is that it was the first company to take on Osborne and succeed. With Compaq, Kaypro is currently the largest-selling portable computer line. It's is also the only personal computer company with its own retail magazine.

Best Idea The price, and the program that lets you read and write disks from other computers.

Worst Idea Selling their documentation short.

Comments This computer is a workhorse, not a fashion plate. If you're looking for value in a complete system for your

money, and don't care about IBM compatibility, it's hard to beat the Kaypro lineup. Only the Morrows can compete head to head.

This is true despite the serious documentation failures, and even though we personally think the machine's appearance lacks grace and style (and we all know how vital that is). Familiarity with Perfect Software breeds our contempt, so we would take WordStar, buy MailMerge, and another calc program. If funds were short, we'd settle for the Perfect group. We'd also find somebody to explain CP/M to us, otherwise we'd soon be lost; and we'd join a user group and subscribe to the *Pro-Files* magazine immediately.

If we could afford it, we'd take our chances with the hard disk system as this week's "Best Buy," because you just can't beat a hard disk for speed and convenience (even if it does run all the time with an annoying hum). Failing that, we'd squeeze out a few more bucks and get the Kaypro 4. The extra disk capacity in either case would raise our rating below to high-level data base management.

Ratings This computer is suitable for: Heavy Word Processing (when using with WordStar); Casual Spreadsheeting; Low-level Data Base Management; Advanced Programming; Lengthy Telecommunications; and Heavy Personal Productivity. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Good. *Portability:* Transportable.

Macintosh

Apple Computer, Inc., 20525 Mariani Avenue, Cupertino, CA 95014. (408) 996–1010.

Features *Size:* 9″ wide, 11″ deep, 14″ high; weight 21 lbs. *Display:* 9″ black and white CRT, 512 × 342 pixel graphics resolution. *Keyboard:* detachable; Selectric-style; 58 keys, no cursor control keys (uses mouse for cursor control). *Processor:* Motorola MC 68000 16/32-bit. *RAM:* 128K. *ROM:* 64K (contains operating system software). *Mass storage:* one $3\frac{1}{2}$″ microfloppy disk drive, 400K capacity. *Interfaces:* two RS-422 serial ports; mouse port; audio connector from four-voice sound generator. *Software:* proprietary operating system in ROM. *Other features:* Mouse cursor-control device; internal clock-calendar with battery backup. *List price: $2495. Options:* second, external microfloppy disk drive, $495; Im-

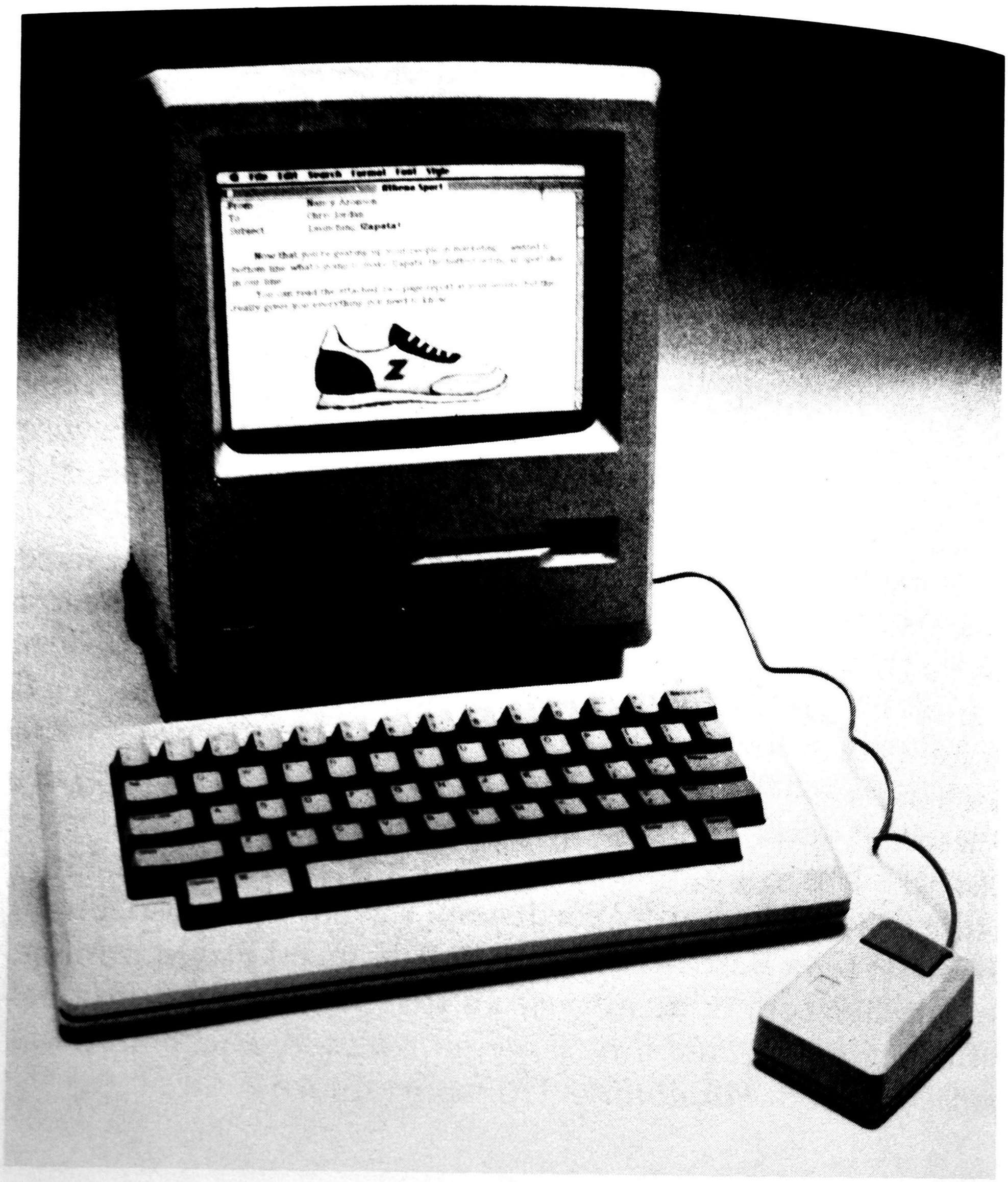


Photo 6-7. Macintosh.

agewriter printer, $475; padded nylon carrying case, $99; numeric keypad, $99.

Quality Apple's products always have been of the highest quality, and the Macintosh is no exception. The parts fit together well, and everything works as advertised. Macintosh was designed to be assembled from start to finish in 27 seconds, and this industrial design is reflected in the absence of stick-on nameplates, screw-on handles, snap-on covers, and other details that tend to make quality control a nightmare for many manufacturers. The case is in two pieces, the name and logo are part of the injection molding, and the

whole unit is held together with a surprisingly small number of screws.

This elegant design carries over on the inside, too. The main logic board (the brains of the computer, where all the chips and circuitry reside) is smaller than an $8\frac{1}{2}'' \times 11''$ piece of paper, yet it contains a computer as powerful as any on the market. The disk drive is manufactured by Sony, which also has a reputation for top-flight quality. All these factors result in a product that may well win awards for industrial design.

Operation and Friendliness Friendliness is Macintosh's middle name. Based on the same kind of graphics-oriented user interface as Apple's Lisa computer, Macintosh is a delight to use. All commands are represented either by names that appear on screen menus or by pictures called icons. To activate a command you simply "point" to it by using the mouse controller. The mouse, a small rolling box about the size of a cigarette pack, controls an arrow on the screen. By moving the mouse on the desktop, you move the arrow. When you want to choose a command option, you move the arrow until it's on the command you want, and then click the button on top of the mouse to select the command.

This interface is extremely intuitive—when you want to do something, you just point and click. You don't have to remember any commands because the options you have at any given time are displayed on the screen for you to choose from. The options might take some getting used to if they had strange names, but the names are all easily understandable. To list the contents of a diskette, for example, you point to an icon that looks like a diskette and click the mouse button. Diskette files will be displayed either by name or as a series of icons that represent each type of file. A word processing file, for example, would be shown by an icon that looks like a page of text, while a graphics file would be shown as an icon that looks like a drawing.

The Macintosh operating system is very intelligent. It knows that when you select a text file, you'll need the word processing software loaded as well, and it loads that program automatically. If you choose a graphics file, the graphics program is loaded automatically. If you want to create a new file with a program, you select the icon that represents the

program itself (there's a little label on the icon with the name of the program). The system also lets you put labels on individual file icons so you can tell them apart if you have more than one file that uses the same kind of icon. And, if you prefer, you always can have the files listed in text, either in the order in which they were created or in alphabetical order.

When you're using an applications program, categories of commands appear as labels at the top of the screen. Once you select a category, a "pull-down" menu of subcommands drops out of the label and you simply move the pointer down to the command you want. In the word processing program, for example, a selection of typestyles would be on a pull-down menu under the label, "Styles." The styles listed on the menu might be Boldface, Italic, Roman, Shadowed, Outlined, or others. You simply would move the pointer down the list of options until you found the one you wanted and then click the mouse button to select it. Once you selected the option, the menu would disappear. This point-click command interface results in a product that is as easy to learn as any computer we've ever seen. Even if you've never used a computer before, you'll be using Macintosh productively within an hour.

The horsepower provided by the 16/32 bit Motorola processor—it has a clock speed of 10 MHz—makes the graphics-oriented interface possible and also lets you do some amazing things with Macintosh's display. The resolution of the screen is very high, and allows you to display text in a variety of type styles, sizes, and fonts. The MacPaint graphics program lets you do just about any type of drawing you want (even to editing drawings on a pixel-by-pixel level of detail) and then pasting drawings directly into word processing documents.

For all of Macintosh's friendliness and extraordinary graphics capabilities, there are some hardware tradeoffs (made in an effort to keep Macintosh small and relatively inexpensive) that will take some adjusting to. For one thing, there's only one disk drive. This makes copying files onto backup diskettes a fairly tedious process. There's also the matter of disk space. Since Macintosh only has 128K of RAM, most of the programs available for it don't load completely into memory. This means that you have to use diskettes that both

contain the software and store data files. The MacPaint/MacWrite diskette that Apple was offering with the computer during its introduction left about 120K of file space on the program diskette. Depending on the size of the program you're using, you could have considerably more than that, though, since the diskettes offer 400K of storage each. You can buy a second disk drive for Macintosh for about $500, but this limits the unit's transportability.

Another tradeoff you'll have to adjust to is the lack of cursor control keys on the keyboard. All cursor control is done through the mouse, which makes a lot of sense if you're doing a lot of pointing, but may be disruptive when you're doing keyboard-intensive work like word processing. Having to move your hand away from the keyboard every time you want to scroll to another paragraph or even to the end of a line may well be more trouble than it's worth. The lack of actual cursor keys could easily be remedied through software—programmers simply have to designate a diamond-shaped cluster of keys like I, J, K, and L that, when used the the Control key, will move the cursor—and no doubt software developers will offer this cursor control option with keyboard-intensive programs.

As for transportability, it's our feeling that Macintosh's mobility is incidental, rather than central, to the computer's design. Apple designed a product that wouldn't take up much desk space (the computer occupies a desktop area about as big as a standard piece of paper), and as a result it's small and light. But the carrying case for Macintosh is a $99 option, and the machine isn't designed to be carried very far without this protective cover. We can say that the diskettes Macintosh uses are likely to travel far better than standard $5\frac{1}{4}''$ floppies, though. The Sony $3\frac{1}{2}''$ diskettes are encased in hard plastic housings that protect the magnetic media inside so well that you could stick these diskettes in your pocket and sit on them without fear of data loss.

To its credit, Apple has said that when 256K RAM chips become available in quantity, Macintosh owners will be able to upgrade their RAM capacity to 512K, which is about all you could want. The disk drives, too, are said to be headed toward a double capacity of 800K. These improvements will remove just about all complaints about storage or program

area limitations on the machine. All in all, Macintosh is as friendly and immediately useful as any computer you're likely to find within the next year.

Documentation The documentation for Macintosh is up to Apple's high standards in this department, but considering how easy it is to use the product itself, you won't need the manual much. There's an audio cassette that takes you on a mini-tour of the computer, walking you through the procedure for turning on the power, inserting a diskette, and issuing commands with the mouse. Also supplied is a short user's manual which describes the use of the interfaces, the way the operating system works, and how to use operating system functions like setting the clock, changing the display of filenames, and other things. But the computer is so much fun to use that you'll want to spend your time with it, referring to the manual only occasionally. This is about the only computer we've seen where you can get away with such a cavalier attitude toward the documentation.

Software During its first 100 days on sale, Macintosh was supplied with Apple's MacWrite and MacPaint programs, but it was our understanding that after the 100 days the computer would be sold without applications software. Apple was supplying the software for a good reason—Macintosh is completely incompatible with other computers on the market, and prospective buyers are understandably concerned about having useful programs to run on the machine. MacWrite and MacPaint were the first in what will doubtless be a very long list of software for this product. Apple predicts that there will be 150 different programs available for the computer by the end of 1984, and from what we've heard from software developers that seems likely. Products already announced include the PFS: series, Multiplan, Microsoft Word, and a multifunctional program (á la 1-2-3) from Lotus Development.

Early versions of MacWrite, rushed into production so they'd be available at the Macintosh introduction, had some bugs and some serious limitations. Files were confined to about 12 pages in length, and you couldn't chain files together to produce longer documents. The formatting, while capable compared with many non-Macintosh word processing programs, seems watered down on a machine with this kind of graphics ability. There are no easy ways to format

multiple columns on the screen, and there's no split-screen editing. Microsoft Word probably will be available by the time you read this, and if ever there was a word processor born to run on Macintosh, that is it. With Word you can create and store up to 100 different page layouts, create and store typefaces, and do just about anything you'd want to do on a typesetter or printer.

MacPaint, the Apple-supplied graphics program, is awesome. You can choose from over a dozen brush sizes, 32 different patterns, and several kinds of shapes. You can draw freehand, use a "spraycan" mode to airbrush drawings, and custom-design fill patterns or backgrounds as you wish. Drawings can be stored in files, copied to new files, copied within files, shrunken, enlarged, stretched, squashed, reversed, and mirrored. In short, the program makes anyone an artist, and the only danger involved with using it is that once you sit down, it'll be hard to tear yourself away. Since Macintosh currently has only a black and white monitor, MacPaint only produces black and white drawings, but some clever entrepreneur is sure to come up with a color graphics program with similar capabilities.

We also took a look at Multiplan on the Macintosh, and found it far easier to use in certain ways than it is on other computers. Formatting, particularly, is a breeze on Macintosh. To widen a column, for example, you simply point to the line you want to change, select it by hitting the mouse button, and then "drag" the line over until the column is as wide as you like. The commands are featured at the top of the screen, and each label contains a group of commands for formatting, calculating, and so forth on pull-down menus.

Beyond these applications, though, is the Macintosh operating system itself. When you turn the computer on and load a diskette, a series of labels at the top of the screen show some of the system options. There's an icon of an apple that, when you open it, displays a menu of system adjustments and utilities, which include setting the clock, changing the keyboard's repeat speed and sensitivity, and adjusting the sound. There also are mini-programs, called Ornaments, that include a memo pad and a puzzle (for entertainment during boring telephone conversations, no doubt).

There isn't a great deal of software for Macintosh yet, but what there is shows that just as this isn't any ordinary

computer, the software being created for it isn't quite like any other software you've used. Programs for Macintosh are likely to be far friendlier, easier to learn, and more fun to use than those on other computers.

Reputation/Reliability Apple has a good reputation in the industry for reliability. If it weren't for the problems with the Apple / / / model, this reputation would actually be spotless. Apple products are well-made and extremely well-supported, both by the company itself and by a dealer network that numbers around 2,000 locations in the U.S. and Canada. Apple chairman Steven Jobs has said that Apple's future will be centered around Macintosh and products like it, and since it isn't compatible with the ubiquitous MS-DOS operating system, Apple has a lot at stake here. It's safe to say that failing to support this product as well as possible would be a fatal mistake for Apple. You can rest assured that it's a mistake Apple won't make.

Claim to Fame Ease of use has to be Macintosh's main claim to fame. It takes the finest, most elegant, most advanced personal computer technology and makes it almost as easy to use as a telephone. This computer will make computing possible for thousands of people who never wanted to learn about control/key sequences and DOS commands. This computer will change forever the way people think about computers and the way they should work.

Comments Macintosh will undoubtedly sweep Product of the Year honors throughout the microcomputer industry. It is, to paraphrase Steve Jobs, "The neatest product we've ever seen." We suggest you think hard about Macintosh's current software, disk storage, and RAM limitations in terms of your applications, because if you wait until after you've seen the computer, you'll be smitten and it will be too late. This is a *very* easy computer to use, and to fall in love with. If you need IBM compatibility, or want to build monster spreadsheet models, or have a heavy data base management application, then don't tempt your willpower by looking at Macintosh. If, however, your needs fall within the current capabilities of Macintosh, then you would do well to check this product out. If you can wait just a little, the groundswell of support for Macintosh within the industry (which matches that which followed the IBM PC and the Apple II) soon will eliminate any of the applications limitations from which this

product currently suffers. Macintosh is definitely a milestone in the personal computing industry.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, Low-level Data Base Management, Advanced Programming, Lengthy Telecommunications, and Heavy Personal Productivity. *Software Availability:* Fair. *Ease of Use:* Excellent. *Compatibility:* Poor. *Portability:* Transportable.

Pied Piper

STM Electronics Corp., 525 Middlefield Road, Menlo Park, CA 94025. (415) 326–6226.

Features *Size:* 20″ wide, 11″ deep, 4″ high; weight 12½ lbs. *Display:* none. *Keyboard:* 61 Selectric-like keys, no numeric keypad, no separate function keys, two dual-purpose cursor control keys. *Processor:* Z80A. *RAM:* 64K, not expandable. *Mass storage:* one slimline 5¼″ disk drive, 784K capacity. *Interfaces:* Centronics-type parallel printer port, external video monitor RCA port, radio frequency (RF) modulator connector for television display (with add-on plug). *Software:* CP/M 2.2, special single-drive file transfer utility, Perfect Writer, Perfect Speller, Perfect Calc, Perfect Filer. *List price:* $1295. *Planned options:* external second drive, 784K capacity, $550; additional RS-232 serial ports, $200; modem, $300; 2 lines of 80 chars. LCD display, $500; 10 megabyte (MB) hard disk, $2500; carrying case, $49. **NOTE:** STM has recently announced a new model, the STM Personal Computer. The Personal Computer looks a lot like the Pied Piper, except that its keyboard is detachable and a 16-line LCD display sits where the Pied Piper's keyboard did. The new computer weighs 17 pounds and uses the MS-DOS 2.0 operating system. Its main features are: 256K of RAM (expandable to 512K); a built-in, 40-column thermal printer; two, half-height, 5¼″ disk drives (1MB capacity each); two RS-232 serial ports; a parallel printer port; and a built-in, auto-dial/auto-answer direct-connect modem with a built-in speaker phone. The keyboard has a standard typewriter-style layout, a separate numeric keypad, and 10 function keys. Unlike many other MS-DOS computers of this type, the STM Personal Computer uses the Intel 80186 microprocessor, which should give it a faster processing speed than most of its competitors. The

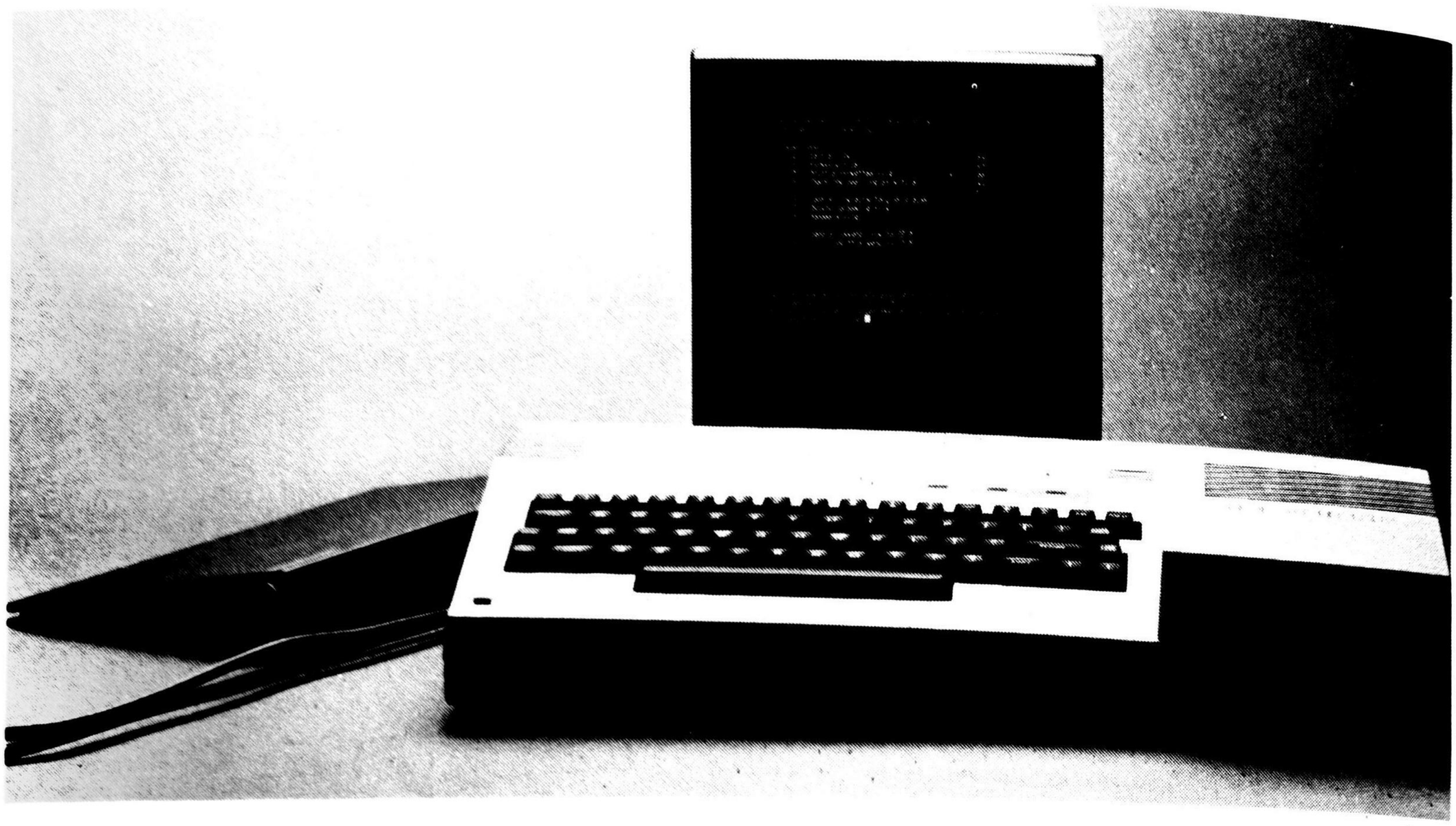


Photo 6-8. Pied Piper, with monitor.

price is about $3100. The new model was announced too late for us to evaluate fully.

Quality The Pied Piper is a mighty peculiar machine. STM Electronics took a completely different tack from other portable makers: you get a keyboard with computer inside, and a single disk drive, and a handle—No monitor, no second disk drive. The advantage is it's cheap ($1295) and light (12 pounds). Buy two monitors for $150 each, place them in different locations, and you can travel back and forth between them without pulling your arm off. And just to make things interesting, the disk drive is two to four times the size of the combined disk capacity of other portables. This concept has caused a bit of a stir in the industry, and a lot of attention from cost-conscious buyers.

When it comes to quality of execution, the Pied Piper seems to be a mixed bag. The casing is of solid metal, the keyboard is acceptable, and there's a power light indicator, which is handy since there is no CRT. The disk drive is from Mitsubishi and is designed for improved tracking and minimal maintenance. The power supply is oversized to accommodate disk drive expansion. Internally there's a connector that can be hooked up to an STD bus card cage, for some substantial expansion.

On the down side, the high-capacity disk drive sits loosely

in its casing. The light plastic keyboard cover is flimsy (we broke it within an hour). The slide-out carrying handle seems too lightweight, like it's just waiting to break. We've heard complaints that the television display isn't that great. And finally, although it carries like a briefcase (a friend said it looked just like a "boom box" portable stereo set), there are no rubber bumpers on the front of the unit, so when you put it down upright, like a briefcase, the front of the unit gets scratched. All this is unsettling, because you don't carry a 784K disk drive computer around unless you have some confidence in the quality of its manufacture.

Operation and Friendliness Using this computer is as easy as using any other transportable: plug it in, plug in your external monitor, and turn it on. It loads automatically when you insert a disk.

They've gone overboard simplifying the keyboard, though: there are only eight keys you wouldn't find on an electric typewriter. There are only two cursor arrows—one for up–left, one for down–right. This is a really lousy idea. There are no function keys, the presence of a "function" key notwithstanding. (If the numerical keys are programmable, that is not evident from the documentation.) In sum, keyboard layout has no conveniences.

The computer seems to operate well, with fast and efficient disk access. The availability of almost 800K of disk space is overwhelming to someone accustomed to using paltry 185K drives. You can (and in fact must) put your entire program library on one disk: word processor, speller, footnote program, indexer, grammar checker, card box, CP/M utilities, a few choice freeware utilities, a disk patch program ... big disks are nice.

Of course, there's only one drive, which means that you either have to use a word processing program that loads entirely into memory at once (which neither Perfect Writer nor WordStar do) so you can switch to a data disk, or you have to copy your entire program library onto each data disk, an inconvenience to say the least. And while they have provided a special copy program so you can make backup copies, you still must put disks in and out of the drive a dozen times to back up one disk. That means you won't bother to make backups as often as you should.

The bottom line is that a single-drive unit is inadequate

for serious use, regardless of the capacity of the disk. Despite the Pied Piper's elephantine disk capacity, don't think for a minute that this will serve as a long-term substitute for a two-drive system.

On the other hand, you might buy this unit with the clear and present intention of getting the proffered external second disk drive as soon as funds are available. You will stumble along with the awkward single drive until then. When you buy that second drive, you'll have a briefcase-sized computer with the power of a transportable (and then some). Leave the second drive and the monitor behind them when traveling, using a local television set while in transit. Viewed this way, the Pied Piper doesn't look like quite the idiot idea it may first appear.

Software Like so many companies keeping an eye on their costs, Pied Piper has bundled in the Perfect Software line: Perfect Writer, Speller, Calc, and Filer. This is an integrated line of acceptable quality, though hardly "perfect." It is reviewed in more detail in Appendix A. As mentioned earlier, it would have been more appropriate for the single-drive model of the Pied Piper to bundle software that loads completely into RAM at once, so you could swap disks.

No programming languages are included.

Because of Pied Piper's unique, high-density disk format, you can't just go out and use any software on the market with the computer. Pied Piper is adapting best-sellers to its format, though: SuperCalc, MBASIC, dBase II, Mulitplan, WordStar and others are available at the moment. If the computer sells well (at $1295 it's obviously aimed at a mass market), more software will no doubt be adapted.

Documentation Besides the Perfect Software documentation, which is adequate, there is a Pied Piper User's Manual. This can be read cover to cover in one sitting, and will tell you, in twenty-five words or less, how to perform any of the standard CP/M functions like copy and format, and how to plug in the external monitor. It tells you very little else. It would be nice to know how to use the "function" key, whether there are any programmable keys . . . things like that. A Technical Reference Manual is available for the technicians. As with most portables, the Pied Piper glosses over the initial learning process for the beginning computerist.

Reputation/Reliability A ninety-day warranty is given. Service is from Xerox. We have no idea how the high-density drives will stand up to a lot of moving around.
Claim to Fame The Pied Piper offers a way of building up to a full high-performance system at a low initial cost.
Best Idea The monster disk drive: without this, the computer would have little to recommend it.
Worst Idea The cheap keyboard cover and lack of bumpers to protect the unit during transportation (forcing you to buy the carrying case). And the very limited keyboard with only two arrow keys.
Comments If you're wild for disk capacity and like to hold on to your cash, this is a good place to start for working your way up to a two-disk system. Weigh this against low software availability, the mediocre keyboard, and some worries about travel durability of the drive. As a single-drive system, it is of limited use.
Ratings This computer, with one disk drive, is suitable for: Casual Word Processing, Casual Spreadsheeting, Low-level Data Base Management, Casual Personal Productivity, Lengthy Telecommunications, and Simple Programming. *Software Availability:* Fair. *Ease of Use:* Fair. *Compatibility:* Poor. *Portability:* Portable.

Sord M23P

SORD Computer of America, Inc., c/o Mitsui Inc., 200 Park Avenue, New York, NY 10166–0130. (212) 878–4403.
Features Size: 17″ wide, 16″ deep, 5″ high; weight 16 lbs. *Display:* none. *Keyboard:* integral; 91 keys including separate numeric keypad, 7 function keys, cursor arrow keys in row. *Processor:* Z80A plus arithmetic processor. *RAM:* 128K, not expandable. *Mass storage:* two $3\frac{1}{2}$″ Sony microfloppy disk drives, 290K capacity per drive. *Interfaces:* Centronics-type parallel port, two RS-232 serial ports; proprietary bus with three slots open. *Software:* SB-80 (CP/M variant), PIPS III multifunction spreadsheet program, proprietary business BASIC. *List price:* $2185. *Options:* fold-down detachable LCD, 8 lines of 80 chars, $795; monochrome monitor, 25 lines of 80 chars., or color monitor, 8 colors, 640 × 256 pixel graphics resolution; IBM 3270 emulation software for mainframe

compatibility; expansion through proprietary bus; carrying case.

Quality The Sord appears to be a well-made machine, matching the quality of its Sony microdrives. It's a heavy unit with no handle that is transportable only because it is integral. The case is metal, the keys of an odd design but secure.

Operation and Friendliness The Sord is a Japanese computer that has not been redesigned for the American market, so it reflects some aspects of the Japanese computing industry that are different from what is found here.

The keyboard is composed of short, rounded keys, different in design from anything else we've reviewed. The keys work well for touch-typing but reflect the fact that, in Japan, almost no computer users know how to type. The keyboard is therefore designed for nontypists.

Other than the ambience of the keys, it's a typical QWERTY keyboard with the computer keys in conventional places. The separate keypad is superior to most others we've seen, being a full accountant's keypad with arithmetic keys, correct entry, and triple zero keys. The cursor arrow keys are in a line, but at least they're separated from the rest of the keyboard. There are seven function keys, plus two "sensory" keys that remained unexplained after a perusal of the operating manual. "Reset" is in the form of a key on the keyboard.

The only applications software bundled with the Sord is the famous (in Japan) program PIPS (Pan Information Processing Systems—yecch!). It's a combination spreadsheet, file manager, and graphics package somewhat like Lotus 1-2-3, except it was invented five years ago. PIPS is easy to use, fairly easy to learn, and very powerful in producing work useful for a business person.

Software In its promotional literature, Sord compares PIPS with BASIC, instead of comparing it to VisiCalc and SuperCalc, its obvious competitors. This makes sense only when you realize that in Japan, businessmen who use computers also program them in BASIC. They make their own programs, which of course takes forever and is filled with errors. There is not the well-developed software market we have here. The result is that PIPS is promoted as a substitute for business BASIC.

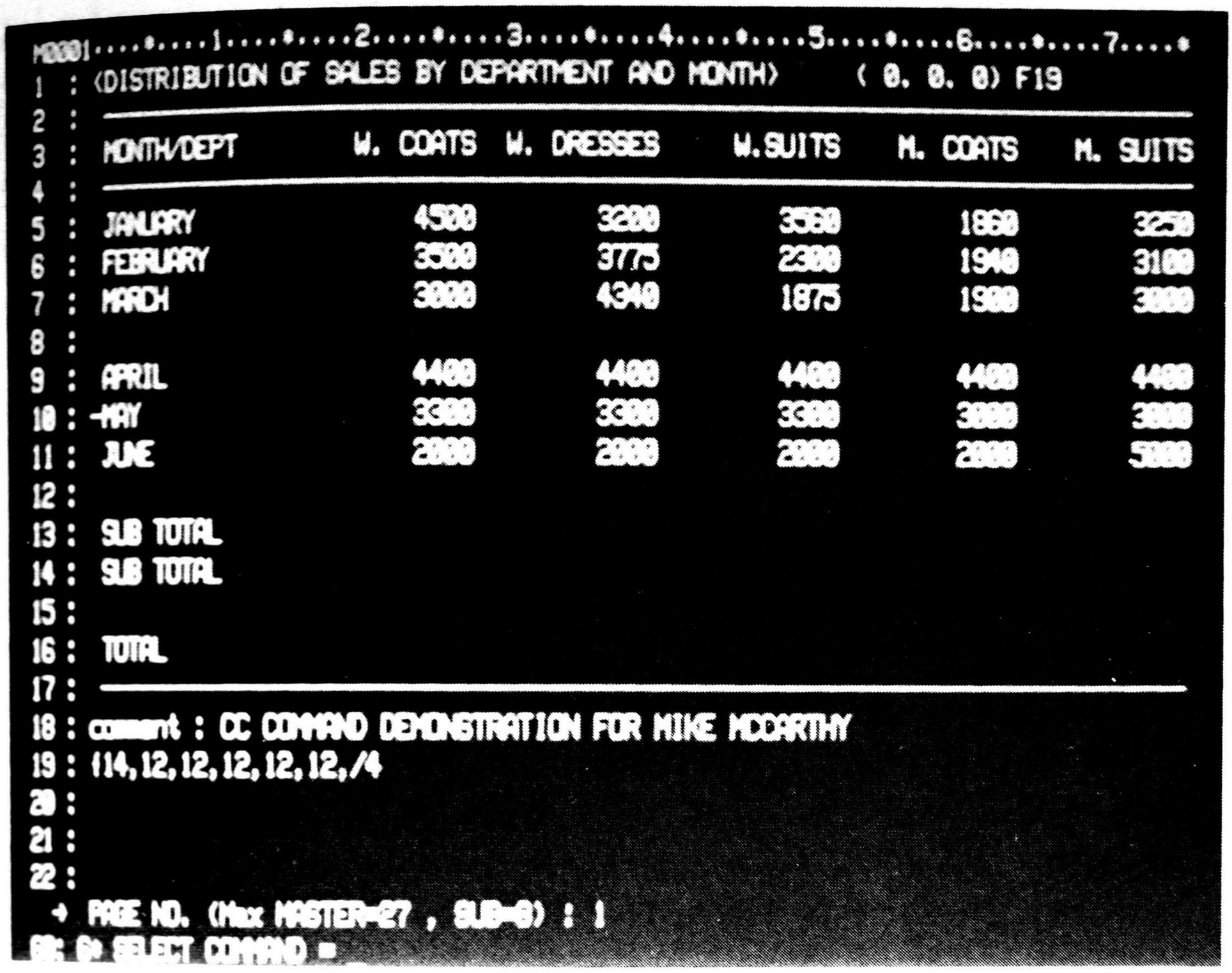


Photo 6-9. A view of the PIPS program in action.

As a substitute for writing your own business BASIC programs, PIPS is, of course, superior in every way, as are all calc programs. And PIPS compares well with American calc programs. The chief difference seems to be that PIPS expects you to be somewhat organized when you decide to crank out a spreadsheet, and the program is set up to cater best to an organized worker. SuperCalc, on the other hand, assumes you are a typical totally disorganized, "wing it" American business professional and is therefore free-form in its organization and chock full of ways to back and fill as you build your spreadsheet.

With PIPS, you first take out a piece of paper and roughly outline how your spreadsheet will look: let's see, we'll have six categories of cloth goods, listed in sales by month, so that's six columns of numbers. When you start up PIPS, it first asks you for a title, then for several lines of headings to identify the report, then for how many columns you plan to build. You then title the columns. PIPS guides you quickly and efficiently through the construction of the report. Movement across the rows as you fill in the numbers is automatic, and when you get to the end of the report, PIPS automatically

drops down to the next line. This is handy: you spend a lot less time shoving the cursor around with PIPS than you do with an American calc program.

You can still insert extra columns and rows, move information around, and change your mind as you go. But you quickly discover that, indeed, your spreadsheets are easier to make and look better when you plan what you are doing, rather than just ad-libbing as you go. Of course, SuperCalc and VisiCalc are popular because they are so easy to ad-lib with. In fact, they seem to encourage it, whereas PIPS—while never getting in the way of your wasteful, inefficient, slothful American habits—quietly urges you to do things in a purposeful way.

Fine, but while PIPS has such necessities as sorting and variable column widths, it lacks a few new-wave calc goodies such as dollar signs, extra-fancy formatting, lookup tables, and other bells and whistles that mark SuperCalc2 and Multiplan. Still, there's more to PIPS than this. PIPS is also a graphics program. Want to display Women's Coat sales as a bar chart? Enter a command, answer a few prompts, and a really neat bar chart is instantly displayed. PIPS' graphics, which produce bar, line, and scattergram charts, are fast and very easy to use. One begins to understand something of the appeal of graphics displays when using PIPS.

But that's not all. PIPS is also a file manager. You can create screens for entering data then use that information for your spreadsheets or your graphics display later. Sort the entries, select out specific data, perform math operations on them—all the usual file management capabilities are here, just as in Lotus 1-2-3.

And finally, PIPS can integrate BASIC programs and include BASIC programming features for creating automatic spreadsheets using data base files. So PIPS combines a spreadsheet, a graphics program, and a file manager—like Lotus or Context MBA—and extends this power with a kind of simple programming language. This puts it squarely in the league of the most advanced American spreadsheet programs available.

Other interesting facts: the columns can be colored, if you have a color monitor; information is kept in "pages," 60 lines of 150 characters, and 31 pages can be linked together to form a gigantic calc sheet.

Of course, not all is ideal in the world of PIPS. It can be cumbersome, especially for a disorganized Yankee. You have to enter specific commands to change different kinds of data, depending on whether it's title information or data information. With SuperCalc, you just move the cursor to the cell and type in a new entry. And there are no on-screen prompts of the available commands. In fact, the available commands are the biggest problem. PIPS has 60 main commands (versus 20 to 40 for other calc programs), and they are *not* intuitive. Try these on for size: *ACM, AS, AU, BT, CA-A, MAW, TRM, W, DC, SFN*. We found it quite hard to remember what was what, and it doesn't help a lot to know the names that go with these commands, because they're artificial invented terms. For someone used to programming in BASIC, PIPS must seem like a simplifying godsend, rather the way dBase II seems to a COBOL programmer. But to someone used to a less powerful calc program, it's a step up in power and also in how much you have to learn. The competitors, Lotus, 1-2-3 and Context MBA, are easier to learn.

Documentation The operating system manual is well-written and complete, which is a good thing because it's a special operating system similar but not identical to CP/M (Sord says they will be releasing CP/M with the computer soon). But it has no table of contents and no index.

The PIPS manual is three hundred pages long and quite good. It is tutorial and organized by command, in alphabetical order. An index of all 60 commands appears at the bottom of each and every page in the book, so you always know where to look to refresh your memory about a command (which you have to do all the time because there are so many of them). The book is carefully laid out, set in large type, and has a general index as well.

There is a reference guide to the proprietary BASIC language, which is of no use to the beginner.

Reputation/Reliability Sord is a big seller in Japan and its PIPS program, billed as "no-programming programming," is wildly popular; there's even a book written about it. Since it's proprietary and only the SORD computers have it, they sell well. The company specializes in microcomputers and has been in business in Japan since 1970. The M23P has been available in the U.S. only since early 1983 and is not widely distributed.

Claim to Fame The PIPS "No Programming" System.
Best Idea Including PIPS with the computer; otherwise this machine would be insufficiently interesting to mention.
Worst Idea Too many commands in PIPS to perform basic functions.
Comments The only reason to consider this computer, given its unique operating system, limited distribution, and minimal portability, is to get the PIPS system. It's the only $2185 computer on the market that runs a Lotus 1-2-3–type spreadsheet/graphics/file manager program, and might just be more powerful in the long run.
Ratings This computer is suitable for: Casual Word Processing, Heavy Spreadsheeting, Low-level File Management, Casual Personal Productivity, Brief Telecommunications, and Simple Programming. *Software Availability:* Poor. *Ease of Use:* Good for PIPS, Fair otherwise. *Compatibility:* Poor. *Portability:* Transportable.

Star-Lite

Computershop, Inc., 139 First Street, Cambridge, MA 02141. (617) 661–2670.
Features *Size:* 16″ wide, 16″ deep, 8″ high; weight 30 lbs. (hard disk version 34 lbs.), aluminum case. *Display:* 9″ green CRT, 24 lines of 80 chars. *Keyboard:* detachable; standard contoured keyboard with 18 dedicated function keys with plastic function key overlay, cursor arrow keys in separate square, large backspace key, delete key; tilt-up knobs hold keyboard at proper typing angle, fold down for transport. *Processor:* Z80A. *RAM:* 64K, expandable (S100 bus system with 4 slots open). *Mass storage:* two double-density $5\frac{1}{4}$ disk drives, 400K capacity per drive, expandable to hard disk. *Interfaces:* serial port, parallel Centronics port. *Software:* CP/M 2.2, Perfect Writer, Perfect Calc, Modem7 freeware modem program, WASH CP/M utility, function key configure program, user-changeable Autostart program. *List price:* $2395. *Upgrades:* Star-Lite Quad has two quad-density $5\frac{1}{4}$″ disk drives, 772K capacity per drive, expandable to hard disk; same software as above, but add Condor data base system Level 1, TCS Accounting Package. *List price:* $3495. Star-Lite HD-20 is hard disk model, 20 megabyte (MB) hard disk with autohead lock, plus one $5\frac{1}{4}$″ 783K disk, (3 bus slots open), Condor, TCS Accounting Package. *List price:* $4495.

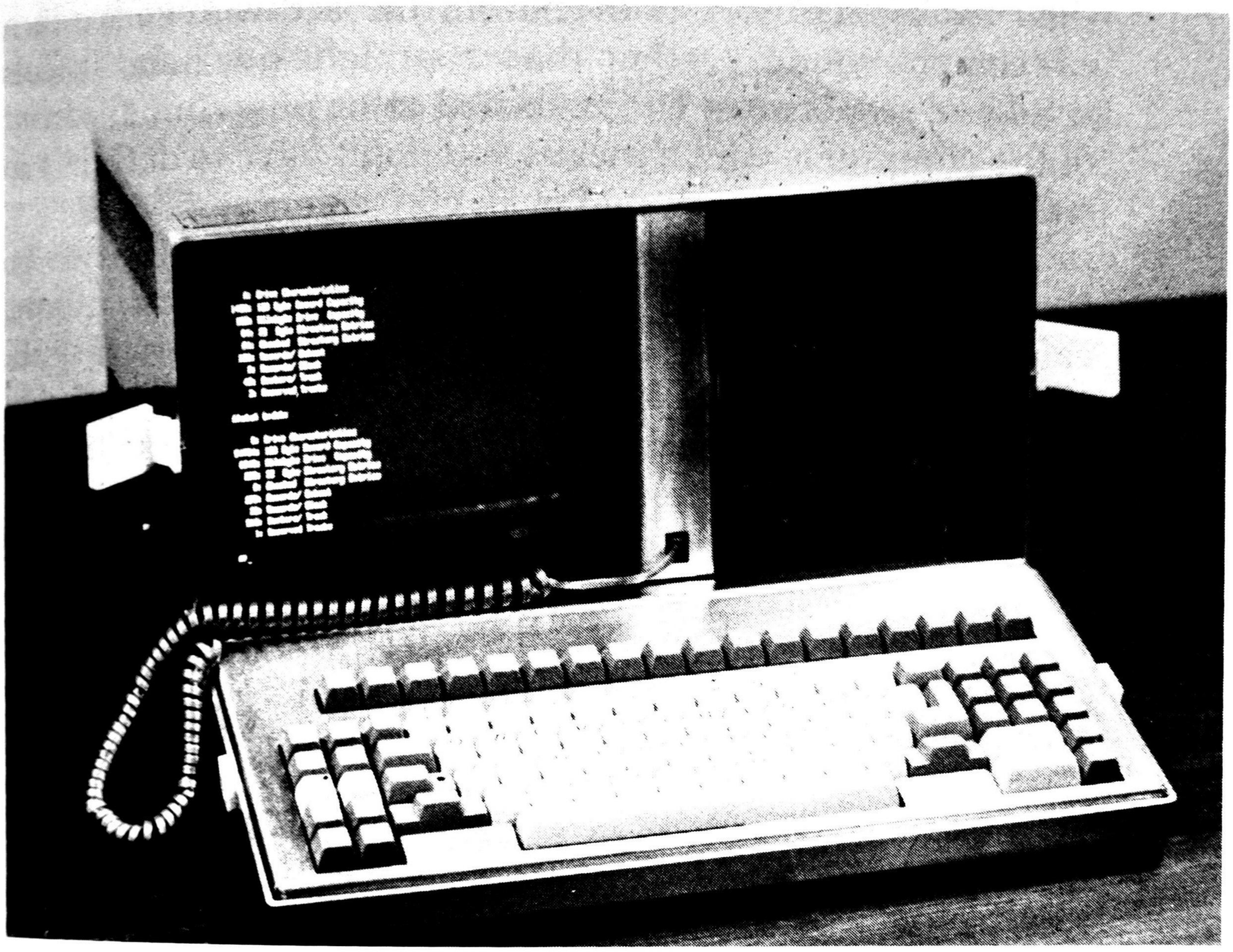


Photo 6-10. Star-Lite

Quality At first glance, this does not appear to be a mass-production portable. The brushed aluminum case, garish blue function keys, the glued-on handmade label, and the machine screws holding it together say "Private Label." (Indeed, the manufacturer is a computer store in Massachusetts.) But the keyboard is solid, the machine screws make it easy to get inside the machine (it's internally expandable), and the brushed aluminum case, while something only an engineer could love, is made of aircraft aluminum and resists banging.

In fact, the model we saw had been subject to the United Parcel Service's special "handle with care" treatment—meaning they dropped it about six feet from the truck to the concrete. The card cage had shaken loose, the disk drives were awry, and the keyboard had popped. Yet when everything was put back together, it worked with only a few minor problems. And the case didn't have a dent. Not a bad performance.

The keyboard is a straightforward, function-key-loaded, Selectric-style computer keyboard with a few nice touches:

the "backspace" key is oversized, the arrow keys are in a convenient square (rather than a straight line), and it feels solid and responsive. The keyboard cable plugs into the front of the computer, which means you don't have to detach it in order to fold up the computer (a convenience).

At 30 to 34 pounds, this machine is not meant to be lugged everywhere, but at least you can trundle it out to the car without its falling to pieces enroute. The hard disk includes a special lock-down routine that lets you transport the computer without gouging the hard disk and its precious data. The computer comes in brushed aluminum, which we understand the techie types just love, or in "IBM blue" for the business types.

Operation and Friendliness This is a standard CP/M computer with a couple of twists. As a CP/M computer, it is no friendlier or easier to operate than any other CP/M portable, but you get used to that.

The hard disk version is a generous 20MB (20 million characters of storage), an appropriate size for this computer's intended market. A 5MB hard disk would have been cheaper, but evidently Computershop is less interested in dropping the price a few hundred dollars than in providing a solid piece of coordinated equipment—and thank goodness for that.

This computer is not really aimed at the beginning computerist who wants hand-holding at every step. This is power in a box—the only S100 bus portable we've seen, and that means you can expand all over the place. Engineers, scientists, business people, and programmers drool at the very thought. Most microcomputers can't be expanded much at all.

Apple- and IBM-type computers have an internal "bus" or connector that lets you plug in more computer boards. You can add memory, an internal modem, boards to run additional disk drives or a hard disk, or specialized boards for specialized computing tasks. Besides the Apple and IBM bus, there are a few more generic bus systems, of which the most established is one called the S100 bus. Many desktop microcomputers designed for high-powered computing use the S100 bus. Compupro and Altos are two examples.

You don't see the S100 bus in many portables because its card cage (where you put the extra boards) takes up more

room than the Apple or IBM bus holder, and is heavier when fully loaded. A Star-Lite rings in at over 30 pounds, making it not "Lite" at all. It is quite large in overall dimensions as well.

But Computershop decided those scientists and engineers and business people in love with their S100 systems wouldn't mind putting a handle on one, and that's how the Star-Lite came about.

There are over a thousand computer cards that can be plugged into the card cage. The Star-Lite will take up to four cards at a time. You can add more memory, a coprocessor to turn it into a 16-bit 8088 MS-DOS computer, or an 8086 UNIX system, or a supermath computer with specialized math chips. A variety of modems can be installed, or a RAM-disk (RAM used as if it were a disk drive—i.e., it runs *real* fast!), extra serial or parallel ports, or special graphics display controller cards that turn your computer into a graphics machine. Analog cards or instrumentation cards will run scientific or engineering machinery and test equipment.

Your portable can be hooked up to dozens of other computers on a computer network (like Xerox's Ethernet, or C Net, or others). You can install not just memory, but bubble memory, static memory, dynamic memory, faster memory, bank-switched memory—and they invent new things every day. Time clocks, speech synthesizers, encryption devices, joystick controllers—when something new comes along in CP/M, it shows up on an S100 board first.

What this really means is that an S100 bus computer will never become obsolete, or fail to keep up with your changing needs. If you're pretty sure your demands on your portable computer will grow, an expandable bus computer like this one—or an IBM-like computer, or an STD bus computer like the Jonos or M6000P—should be seriously considered. (The IBM-like computers and the Jonos and M6000P are reviewed elsewhere in this book.)

Software Perfect Writer and Perfect Calc are included with all three models. See the review of these programs in Appendix A. A modem program is also included, although no modem is included with the computers. The modem program is the well-regarded "freeware" program Modem7. (You can get freeware programs free from user groups. Including Mo-

dem7 in this package is just a convenience.) Likewise, the freeware program WASH is included. This is a "friendly" substitute for CP/M's rather unfriendly housekeeping utilities: copy a file, delete a file, print a file.

There's also a little program that lets you alter the Autostart utility program easily. Autostart automatically loads the program when you put a program disk in the drive.

The high-density Quad and the hard disk HD-20 models include the Level I Condor data base program, an extremely powerful program comparable to dBase II. There are two more levels to Condor, each more complex and more powerful than Level I, and each about $400 in price. The high-density disks and hard disk are particularly helpful when it comes to a data base system of this sophistication.

Also included with the Quad and HD-20 is the TCS Accounting Package: general ledger, accounts receivable and payable, and payroll. You need MBASIC to run this package, and since it's not included, you've got to go out and buy it. The accounting package appears to be the established Peachtree accounting system under another name. Peachtree is a well-debugged, sturdy accounting system for small businesses, and a nice little surprise to find free in your computer box, since it retails for about $2000. Here's where you begin to appreciate that 20MB hard disk.

Documentation The Perfect Writer, Perfect Calc, Condor, and TCS manuals are all fine, clear, and useful. The machine-specific documentation is incredibly dense, written by and for computer whizzes, making it much harder to get up and running on this computer than on most, even though the hardware is all industry standard. (Just as a quick example: by the time you hit page thirteen, you're already into a map of BIOS entry points!) Obviously documentation is still a luxury at the Computershop. One hopes the company will improve its introductory material dramatically in the near future. Meanwhile, if you buy a Star-Lite, be sure to have a technical person around to help get you started and to decipher the documentation. If you're a computer freak, on the other hand, you'll love the technical manual, which gives all the schematics for all the boards and every bit of hardware info you could ever hope for.

Reputation/Reliability The Star-Lite has a ninety-day warranty; service is from the maker, in Massachusetts. Com-

putershop is a retail computer store which also makes a desktop version of the Star-Lite. The computer has been available for too short a time for any reputation to have developed, but the industry-standard components and S100 card cage clearly mean that even if Computershop were to go belly-up tomorrow, you'd always be able to get service and parts.

Claim to Fame The Star-Lite is the only portable S100 computer on the market. Its degree of expandability is unlimited: there are over a thousand cards now available for the S100 bus, and when a new computer component is devised, it is usually released first as an S100 card, to test the market.

Best Idea The S100 bus and the standard parts.

Worst Idea Not including the BASIC you need to run the accounting program.

Comments This computer is for people who are serious about their computing, but who need portability. Business people who already have an S100 setup (say, a Compupro) at work would find this an excellent remote station or take-home expansion, since it can be configured to be compatible with any other S100 computer. Engineers and scientists using Z80 hardware will find the Star-Lite useful for work away from the lab. Serious students of computing who've always wanted an S100 computer might consider the Star-Lite. At $2395, the basic model is not unreasonably priced, considering its potential. And the $4495 price tag on the hard disk version isn't too bad—again because of the S100 potential—and makes it suitable for high-level data base management.

On the other hand, if you figure to be making more modest demands on your computer, there may be no reason to pay extra for power you won't be using.

Ratings This computer is suitable for: Casual Word Processing, Casual Spreadsheeting (because of bundled software), High-level Data Base Management (even more so in the 700K and hard disk versions), Lengthy Telecommunications, Heavy Personal Productivity, and the Most Advanced Programming. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Excellent. *Portability:* Transportable.

M6000P Voyager

MicroStandard Technologies, Inc., Box 319, New Lebanon, OH 45345. (513) 687–1395.

Features *Size:* 17″ wide, 20″ deep, 7″ high; weight 33 lbs. *Display:* 9″ green CRT; 24 lines of 80 chars. *Keyboard:* detachable; Selectric-style with numeric keypad, cursor arrow keys in line. *Processor:* Z80A. *RAM:* 64K. *Mass storage:* two $5\frac{1}{4}$″ floppies, 376K capacity per disk. Connections for two external 8″ floppies. *Interfaces:* RS-232C serial port, Centronics parallel port; STD bus cage with 6 expansion slots open. CP/M 2.2, WordStar with MailMerge, SpellStar, CalcStar, Archivist file transfer program, BASIC-Z. *Other features:* real time clock with battery; fan; brown vinyl carrying case with diskette and cord pockets. *List price:* $3,900. *Options:* 6 STD bus expansion slots allow addition of direct-connect or acoustic modem; external 8″ disk drives, Motorola 68000 16-bit coprocessor, RAM expandable to 1026K with Motorola chip, used as Ramdisk with CP/M Plus; UNIX operating system; color monitor card; internal hard disk; extensive customization available for OEMs (repackagers) or large accounts.

Quality The M6000P was designed for industrial, scientific, and process control workers, and it looks it. It resembles more a piece of instrumentation than a computer. Unusually long for a portable (to make room for the STD card cage), it has an industrial-strength power supply which makes it extra heavy as well. The case is metal with a plastic overlay that appears flimsy but is only cosmetic. The keyboard, while detachable, is used while attached.

The company describes the M6000P as an "industrial Osborne" and is preparing to release a "consumer's version" called the Model 3000. The new model will be cosmetically more appealing and much cheaper; $1695, but with only one disk drive and *no* bundled software.

Operation and Friendliness Designed for the industrial market, the M6000P has no particular retail market user features worthy of remark. Prototypes of the consumer version, called the MST 3000 (catchy!) show a much smaller, lighter machine with an inviting keyboard.

For the technical types, the M6000P is expandable to the nth degree, thanks to a card cage that takes STD standard cards. This means lots of add-ons are possible, including coprocessors, lots more memory, hard disks, external disks, color monitors, and every kind of scientific and engineering board (since the STD standard is big with technicians). A

Motorola 68000 card running UNIX is planned, although it will run a little slow because the STD bus wasn't made for it.

We couldn't help noticing a row of eight LEDs on the keyboard which (get this) show the ASCII code of any key typed. Useless, maybe, but fascinating.

Software The M6000P is the only portable to bundle the entire WordStar line of software: WordStar with MailMerge, SpellStar (spelling checker), and CalcStar spreadsheet program, all from MicroPro. These are all high-powered programs with acceptable-quality manuals (see the review of WordStar in Appendix A). Also provided are: a BASIC (BASIC-Z); a little game and graphics software to demonstrate the system's capabilities; and a terminal emulation program to make software compatibility a little easier (the screen can act like an ADDS, Televideo, or Lear Siegler—three popular large system terminals). There's also a program called Archivist, kind of an enhanced file copy program.

Reputation/Reliability The M6000P comes with a 120-day warranty, with service by the factory. No information was available on reliability. The company's founders are from the world of computer peripheral manufacturing.

Comments This is a computer for an engineer or technician, especially since the majority of the 750 STD cards available are oriented toward scientific technicians, industrial engineers, and process control. The industry standard STD bus means all the expandability one could ever want, ease of support, and protection against obsolescence.

Ratings This computer is suitable for: Heavy Word Processing, Heavy Spreadsheeting, Lengthy Telecommunications, High-level Data Base Management, Heavy Personal Productivity, and especially Advanced Programming. *Software Availability:* Excellent. *Ease of Use:* Fair. *Compatibility:* Excellent. *Portability:* Transportable.

Briefcase Reviews

GRiD 1100, 1101, and 1109

GRiD Systems Corporation, 2535 Garcia Avenue, Mountain View, CA 94043. (415) 961–4800.

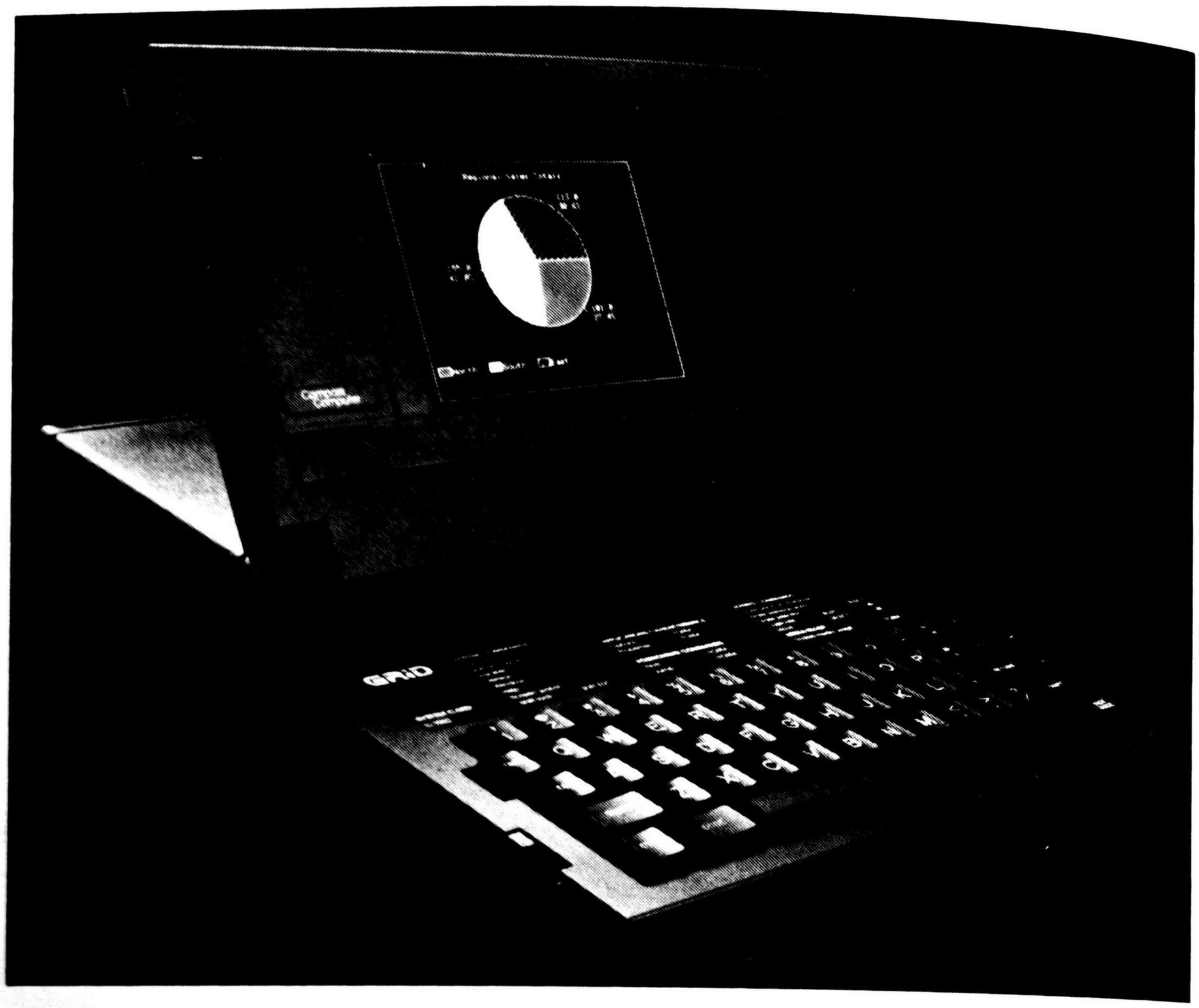


Photo 6-11. GRiD 1101.

NOTE: This computer is now available in three models at three prices. The differences in features between models involve built-in modems and RAM size, as noted below. We tested GRiD's older Compass model, which is the same as the current model 1101.

Features *Size:* 11½″ wide, 15″ long, 2″ high; weight 10½ lbs. (plus 6 lbs. for optional external disk drive unit). *Display:* 6″ amber electroluminescent (EL) panel; 24 lines of 53 chars.; 320×240 pixel graphics resolution. *Keyboard:* attached; 57 keys including shifted cursor control keys; no numeric keypad. *Processor:* 8086 and 8087. *RAM:* 256K (Models 1100 and 1101), 512K (Model 1109). *Mass Storage:* 384K internal bubble memory. *Interfaces:* serial port, IEEE-488 port; DC power jack, modular telephone jack for modem. *Software:* All software, including an operating system, is optional. A fairly large amount of proprietary and third-party software is available at additional cost, running under either GRiD's proprietary CCOS operating system or MS-DOS. Examples of applications programs available are: GRiDPLOT graphics package, GRiDFILE data base management system, GRiD-

WRITE text editor, GRiDPRINT document formatter, GRiDTERM terminal emulator, GRiD3101 terminal emulator, GRiDVT100 terminal emulator, GRiDSERVER peripheral sharing facility, GRiDBASIC, Lotus 1-2-3, WordStar, dBase II, Multiplan, Pascal, and Fortran. *Other Features:* built-in, 300/1200 baud, auto-dial/auto-answer, direct-connect modem (Models 1101 and 1109 only); internal clock/calendar; built-in speaker with software-selectable volume. *List Prices:* (Model 1100, $5995. Model 1101, $6795. Model 1109, $7995.) *Options:* 5¼" external disk drive, 360K capacity, $1195; combination 5¼" floppy disk and 5¼" Winchester hard disk, 10 megabyte capacity, $4100; Compass Central file server (links several computers together), $7495; Management Tools software bundle (includes GRiDPLAN, -PLOT, -FILE, -WRITE, -PRINT, and BASIC, $940; MS-DOS operating system, $150.

Quality There's no contest here. The GRiD compass is an exquisitely well made computer. From its magnesium case to its EL display, from its 8086 processor to its keyboard, this computer stacks up against any other portable like a Ferarri would stack up against a Chevrolet. Both software and hardware performed flawlessly, and we had the impression from GRiD Systems that if we had experienced the slightest problem with the unit, the factory would have sent a representative running to our office to fix things up.

Operation and Friendliness The GRiD philosophy of portable computing is significantly different than anyone else's. While it contains the most hardware in the smallest package, the computer is designed to run only on AC power (a one-hour battery pack was recently made available, but that's like having a one-gallon gas tank on a fine touring car).

As it was originally designed, the Compass (GRiD's original name for the product) was dependent not only on electrical power but also on a telephone line. This was because the only way to load software into the unit's bubble memory was to call up the GRiD Central computer in Mountain View. The bubble memory is large enough to store two applications programs and several data files at once. If it fills up with data files or you want to swap one applications program for another not currently stored in the computer, you have to call up GRiD Central and transfer the programs or files via the computer's built-in modem. This process is fairly involved. Although the communications protocols for con-

necting with GRiD Central are predefined (all you have to enter is the telephone number and your user number), the process of swapping files between your computer's bubble memory and GRiD Central takes some getting used to.

The idea of being dependent on a distant computer for storage of applications programs and data files doesn't appeal much to very many people, so GRiD now offers an external floppy disk or floppy/hard disk combination unit that would allow storage and retrieval of programs in the normal way and its low-end Model 1100 doesn't have a built-in modem. In addition, you can get the MS-DOS operating system (which provides access to a wide array of popular applications programs) if you prefer it to GRiD's proprietary operating system and applications software.

While this computer has been available for over a year, GRiD only began offering the MS-DOS option a few months ago. In terms of being IBM-compatible, this unit just isn't. If you want MS-DOS software, you have to buy it from GRiD. The company's proprietary operating system and applications software, however, are very easy to use and semi-integrated so that you can easily transfer files from, say, GRiDPLAN to GRiDWRITE if you want to put a worksheet in the middle of a report.

Aside from compatibility and GRiD's novel approach to portability, this is a very friendly computer that works like a charm. Its 8086 and 8087 processors make it faster at executing commands than any other portable; its EL display is also fast, and so sharp you nearly forget it's only 6" across.

On top of its clarity, the display gives you lots of options. In default mode, it displays 53 characters on a line, but you can substitute the normal type font for a smaller one that will show you 80 characters on a line. In addition, you can change the length of the lines displayed from 53 columns to as many as 250 columns. The display will scroll horizontally if the line length you select is wider than the window.

Another nice feature of the software and display is that when you give a command, there's always a message at the bottom of the display telling you what's going on, like "retrieving file." Also, the current time and date are displayed on the main system menu. The keyboard, while pretty noisy, has a very positive feel. One problem with the keyboard layout is that the "control" key and the "code" keys (one on

each side) are located in the bottom row of the keyboard, where they're a little inconvenient during normal typing, especially since you use the "code" keys to execute many of GRiD's software commands. Looking at the space the keys have to fit into, though, we can't really suggest any other layout.

Another ergonomic consideration is that after as little as fifteen minutes in operation, the outside of the computer behind and underneath the keyboard becomes hot to the touch and stays that way. This is a deliberate design function. Since this computer contains more powerful hardware than most desktop computers in a case a fraction of the size, there's no room for a cooling fan, and the heat has to be dissipated somehow. The unit's designers took the only possible course, which was to make the case itself conduct the inside heat to the outside, where, from the air circulating around it, it would be borne away. In setting up the computer you're supposed to raise a little foot at the back so most of its underside is off of the desk. This is to help the air circulate, but it also keeps the computer's belly from touching the desktop, where the heat would probably mar a wood finish.

Software The applications we tested with this unit were GRiDPLAN, GRiDPLOT, GRiDWRITE, and GRiDFILE.

Files, whether they're applications programs or data files, are managed in layered groups on this computer. The top layer is the Subject group, followed by the Title layer and then the Kind layer. Subject groups put files into categories, such as tutorial or applications software. Titles are the names of the individual files (whether they're applications or data files) within each subject group. Under the "Programs" Subject group, for example, you might find Titles for a telecommunications programs, GRiDPLAN, GRiDWRITE, a worksheet, and a memo. The Kind layer describes the specific application you need in order to run the Title you selected (a memo would be text, for example, while a customer list would be data base).

When you turn the computer on, your screen is divided in two sections. The top section shows the file groups available, and the bottom section is a sort of blank form you fill in to retrieve a given file or application. You select a file group either by typing the name of the group in the blank box on the form or by moving a highlighted bar down the

list of groups with the cursor control keys and hitting "return." Once you select a group, the blank space on the form moves from Subject down to the next line, which is Title, and the menu on the top half of the screen changes to show you the Titles available under that Subject group. Again, you make a selection and the cursor moves down to the next line, Kind. The menu on top changes to offer various Kinds of files, and once you select a Kind you confirm the entire selection by hitting the "code" and "return" keys at the same time.

If you choose an applications program that isn't currently stored in the bubble, you'll have to retrieve it from GRiD Central or your external disk drive, if you have one. You can move in and out of a *Help* file at any time in any program by hitting "code" and the "?" key. The *Help* file not only tells you the codes for each program function, but it's set up as a menu with a highlighted bar, so that you actually select a command from the menu by confirming it with "code-return." The effect of this is that you see the codes whenever you ask for help, and soon you end up typing the code directly at the program level instead of going to the menu to execute commands. You return to your place in the program from the *Help* file by hitting either "return" or "escape," depending on where you are in a program.

GRiDPLAN is a solid, powerful spreadsheet program that features many of the most coveted features of third-party software like Multiplan. It performs all the standard calculations by formulas and also allows you to: vary individual column widths, lock combinations of cells together, tie row and column labels to the edges of the display no matter where you move in the worksheet, lock rows or columns in place, insert columns or rows into worksheets, and vary the format properties of individual cells. Thanks to the 8087 arithmetic processor, calculations are very fast. The worksheet is also larger than most: 255 rows by 255 columns. Two- or three-key commands move you quickly to any part of the spreadsheet, and you can display two different parts of the sheet in either synchronized or unsynchronized mode.

GRiDWRITE is a fairly good text editor that is, again, extremely easy to use. You can create and edit text with all the standard features such as: automatic word wrap; movement, deletion, or duplication of text by block, word, line,

or character; and finding text strings or finding and replacing them. All these functions are selectable from the *Help* menu, but like the commands for GRiDPLAN, they're also mnemonic, so that erase is "Code-E," find is "Code-F," etc. If you want to print a file, you can include page headings or page numbers (but not footers), and you can change the margins, line spacing, and print size. You can also have paragraphs indented automatically. The formatter isn't terribly fancy, leaving off exotica like list merging, proportional spacing, and superscripts and subscripts, but it does allow you to choose different type fonts.

GRiDPLOT combines ease of use with the outstanding EL display to produce graphs that can only be described as eye-popping. To make graphs, you simply call up a worksheet file, enter "Code-G" to call up the graphing function, select the worksheet cells you want graphed by highlighting them, confirm your selection, and presto, the graph appears. The default setting is for stacked bar graphs, but you can also display clustered bar, line, and pie graphs.

GRiDFILE is a data base manager that is set up like a spreadsheet. You enter your data in columns and rows, and search the data base by referring to them. If names of contacts, for example, are in column A, then to search for names you would ask the program to search column A. The search and condition formulas aren't as straightforward as we'd like to see, but that's true of most data base managers available for microcomputers. You can vary the column widths to fit the information you'll be entering, change the alignment of data within columns or the format of entries (integer or dollars, for example), create indexes of individual columns to make searches easier, and set legal values for columns so the wrong type of information can't be entered. This program is clearly intended for individual users. You can't create custom data-entry forms to make it easy for, say, a secretary to enter data, and the search and sort commands are not exactly easy to teach to somebody else quickly. Still, for customer lists, price lists, and other simple data bases, it is as flexible and powerful as you could want.

Documentation There are two manuals available for the computer, both, unbelievably enough, offered as extra-cost options. There's a 100-page tutorial ($15) and a reference manual of about 500 pages ($140).

The tutorial starts out by describing the basic functions and organization of the computer and its filing system, and then moves into five- or ten-page walk-through tutorials on each of the applications programs. The tutorial exercises are arranged in a double-column format, with the command you type on the left and a graphic of what the screen will show on the right. This makes it easy to follow along and learn the material, which covers most of the basics of operation.

Any questions you might have should be referred to the reference manual, which contains detailed information about the hardware, each application program, error messages you might encounter, a command summary, a glossary, and an index. There's no technical information about the hardware, but GRiD rightly assumes that the type of people who can afford one of these computers won't be interested in that sort of thing, and will refer any technical problems to somebody else. Each section of the manual has its own table of contents. One problem with the reference manual is that commands common to all of the applications programs are treated in the Common Commands section and nowhere else, so whenever you come across a common command in a section about a specific application, you're referred to the Common Commands section. This makes for a lot of page flipping. On the whole, though, the documentation is complete, readable, and well-organized for the type of user these computers are likely to have.

Reputation/Reliability The Compass is a very rugged, reliable computer, and GRiD Systems supports it very well. The company's customer support center is as friendly and helpful as any we've encountered. GRiD also offers workshops on program development and management tools, and consultation on special applications. If you buy a GRiD computer through a dealer, you'll have to send it back to GRiD through the dealer if it breaks. If you buy from GRiD directly, though, you're eligible to sign up for GRiD's service contract, which guarantees they'll have a replacement unit on your desk within one day of your reporting a problem. The standard warranty is for ninety days, but there are optional service programs that can get you everything from three-day training workshops to technical support to free software and documentation updates in perpetuity at prices ranging from $20 to $1200.

GRiD was founded by a former manager from Xerox's Advanced Office Systems Group, who raised a lot of capital and rounded up a first-rate team of engineers from most of the major microcomputer companies. The company has been offering its computers since mid–1982, and despite its high-powered hardware and first-class service and support, sales have been sluggish. This is due both to the high prices and the selective marketing strategy GRiD has used: the computers weren't sold in retail stores until nearly a year after marketing began. The fancy service, high prices, and selective marketing have all given these computers a reputation as the Ferarri of computers.

Claim to Fame The GRiD computers pack more power into a small package than any other computer you can buy. They have faster processing power, a better display, and communicate as well as any portable on the market. These features and high price tags combine to put them in a class by themselves.

Comments The GRiD computer gives you more processing power and a clearer display than any other portable, but without a built-in disk drive we don't consider it as functional. You could buy the portable disk drive option, but that adds over $1000 to an already sky-high price. If money is no object, these are great little computers, providing high performance and true snob appeal in a compact package. But you could have two, three, or even four of anyone else's computers for the price. We also consider it an outright insult that software and even documentation costs extra.

Ratings This computer is suitable for: Casual Word Processing, Heavy Spreadsheeting, Low-level Data Base Management, Lengthy Telecommunications, Casual Personal Productivity, and Advanced Programming. *Software Availability:* Fair. *Ease of Use:* Good. *Compatibility:* Fair. *Portability:* Portable.

Gavilan

Gavilan Computer Corporation, 240 Hacienda Avenue, Campbell, CA 95008. (408) 379–8000.

NOTE: This computer will eventually be available at the retail level, but initial shipments will be sold through other companies who will put their own names on the computer.

The Gavilan is distinctive enough to be easily recognizable no matter what nameplate is affixed to it, however.

Features *Size:* 11½" wide, 11½" long, 2¾" high; weight 9 lbs. *Display:* 9" diagonal LCD; 16 lines of 66 chars.; 400 × 64 pixel graphics resolution. *Keyboard:* 70 keys, including shifted numeric keypad; cursor and program functions controlled through built-in, touch-sensitive panel. *Processor:* 8088. *RAM:* 80K, expandable with plug-in cartridges to 208K, or with external 128K module. ROM: 48K. *Mass storage:* one 3½" disk drive, 320K capacity. *Interfaces:* serial port, external video display port; telephone jack for modem, AC power jack; ports for external disk drive, expansion memory, and printer. *Software:* proprietary operating system with text editor, spreadsheet package, telecommunications, appointment scheduler, and forms processing. Also available (as a package, in lieu of the above), MS-DOS operating system, MBASIC, WordStar, SuperCalc2, PFS:File, PFS:Report. *Other features:* built-in, 300 baud, direct-connect modem; internal, rechargeable NiCd batteries to power the unit for 8 hours and recharge in 1½ hours, DC power cord for automobile cigarette lighter; soft leather carrying case. *List price:* $3995. *Options:* External disk drive, $695 (with extra 64K RAM, $975; with 128K RAM, $1245); printer, approximately $1000.

NOTE: Gavilan recently announced a lower-priced model, the Gavilan SC, which is basically the same as the unit above, except that it features an 8-line display, has no built-in modem, and is supplied with the MS-DOS operating system instead of the proprietary operating system. The Gavilan SC is priced at $2995. The unit was not available for our inspection at this writing.

Quality This is a fairly well made computer that looks and performs as advertised. The case is plastic and seems suspiciously flimsy, but we didn't have any problems with it. The keyboard is responsive, and the display is clear.

Operation and Friendliness There are several touches that make this a very friendly computer to use. On the hardware side, the LCD display is adjustable two ways: you can adjust the angle of the computer lid that houses the display because the hinges that hold the lid open have a series of detents, and you can adjust the angle of the display within the lid with an adjustment wheel. Another nice display feature is that although the LCD displays only 66 characters by 16

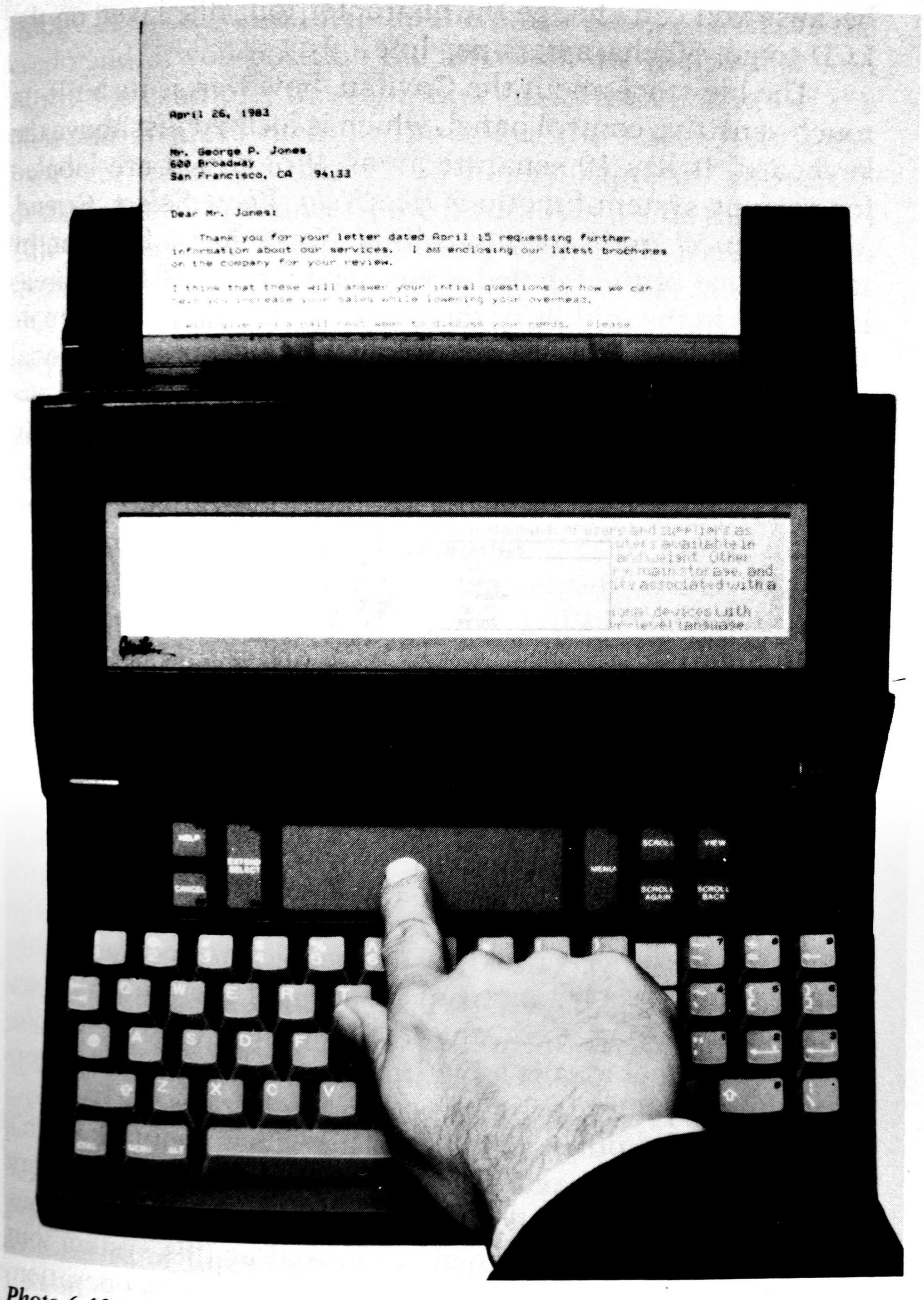


Photo 6-12. Gavilan.

lines, the video output to an external monitor produces a crisp 24 lines of 80 characters display, so you only have to sacrifice display size when you're away from your main base of operations. You may not even have to do it then, though,

because you can change the character font displayed on the LCD to get 80 characters per line.

The big story about the Gavilan, however, is its built-in, touch-sensitive control panel, which is located just above the keyboard. It has 10 separate areas, 9 of which are labeled for various system functions like *Help, View, Select, Extend, Menu, Cancel,* and screen scrolling. You select a function by tapping one of the labeled areas. The largest of these areas is located in the middle of the group, and is a blank rectangle that takes the place of cursor control keys on a traditional computer. Like the labeled areas, the central space is controlled with a fingertip. Moving your finger within it moves the cursor on the screen accordingly. Under Gavilan's proprietary operating system and applications software, the cursor can be moved to select items from on-screen menus. Tapping the screen with the cursor positioned over an item will select it. Under MS-DOS, the 10 touch-sensitive areas act as the 10 function keys you would have on an IBM-compatible computer.

Using the touch-panel for cursor control is very natural; you move your finger to where you want the cursor to be. In fact, the panel is even sensitive to differences in the speed at which you move your finger. If you move your finger slowly, the cursor moves a little bit at a time. Move your finger with a rapid stroke, and the cursor will race from one side of the display to the other. Frankly, we expected to have some problems with the touch panel, but we found it accurate and very dependable. Using it became transparent to us after awhile. The touch panel idea is a big improvement over other alternate-input devices such as mice and light pens.

Software The other side of the big story about Gavilan's touch panel is the menu-driven proprietary operating system and software. The applications software was still in various stages of development when we looked at this system, but we saw the operating system and text processor in operation.

When you power-up the computer, you see a rectangle on the right side of the display that represents a desktop. It tells you the state of the system, including whether the LCD display or video is operating, and whether or not the floppy disk drive is in use. Using the touch pad, you move the cursor arrow to the selection you want (change the display from LCD to video, load the contents of the floppy disk, format a

floppy disk, etc.) and then tap the touch panel to execute the command. If you position the arrow on the floppy disk and tap it, for example, the computer reads the contents of the disk and displays them at the left of the screen, while the message "open file drawer on floppy" appears above the desktop icon. The names of the file folders inside the floppy's "file drawer" are displayed along with little icons next to them that show whether or not each file folder is open.

File folders can be grouped within other folders in any way you like. In the example we saw there was a folder labeled "A-L Client File," which contained other folders for individual people whose names began with the letters A through L. When all the folders are closed, the display only shows the main file. But when you open that folder (by moving the arrow pointer to it and tapping the touch panel) the titles of the folders stored inside it are revealed. Graphically, files stored inside other file folders are displayed with an offset, to reinforce the nested storage concept.

Each file folder is identified by a small icon of a folder next to it. Within each folder, you can store individual documents, with icons that look like small squares. When you "open" a letter, the text of the letter is displayed on the screen, writing over the file menu and the desktop icon.

If you want to perform text editing or printing functions on the document, you tap the Menu area of the touch panel to bring up a menu superimposed over the document on the screen. The menu contains selections for deleting, copying, searching, moving, creating, and printing text, as well as options for undoing a previous command and zooming to see an overview of the document's format. The *Zoom* function is very clever. Hitting "zoom" shows you what looks like an aerial view of the document. The entire document is displayed in an area about $1\frac{1}{2}$" square, and the text on it is shown as a series of lines that accurately reflect the shape of the text on the page. There is a "window" rectangle that you can move over the small page to isolate portions of the document. For example, if you happen to be on the first paragraph of a document at the time and want to jump to the last paragraph, you can position the window on the last paragraph of the zoomed document and then tap the touch panel, and the text will then be displayed on the screen.

The whole setup works very intuitively, aided by the

icons and the touch panel. You see what your options are either automatically or by asking to see the menu, and then you select an option by moving the cursor arrow with your finger and tapping the touch panel. If you can't figure out what you need to do at a certain point, you can tap the "help" area on the panel and bring up a menu that offers a series of options, including basic information, options available to you at that point of the program, an explanation of the action you just performed, and a description of the action highlighted on the menu, among others.

We would like to have seen the rest of the Gavilan software; if it is as easy to use as the text editor, this system represents a significant step forward in friendliness for portable computers. We were told that initial shipments of the Gavilan would come with MS-DOS and the WordStar/SuperCalc2/PFS bundle, but that soon after the product's initial release the proprietary software would be sold with the machine, and the MS-DOS operating system and applications would be an option. For a computer of this size, we found the proprietary text editor adequate, and the operating system was far friendlier than MS-DOS.

Reputation/Reliability Gavilan is a new company, started by Manny Fernandez, the former president of Zilog, the company that makes the Z80 processor chip. The Gavilan was designed by a team of talented people from places like Xerox's Palo Alto Research Center, (which accounts for its touch panel and icon-oriented menus), Hewlett-Packard, and Tektronix, and the firm has attracted a large amount of venture capital. Announced in spring 1983, the Gavilan should be shipping by mid-1984. As the computer was still in prototype form when we reviewed it, there is no data available on its reliability. It will be supplied with a ninety-day warranty. Hardware support will be provided by Gavilan, while software support will be through the companies that purchase the computer to sell under their own names.

Claim to Fame This is the first fully-functional computer small enough to fit inside a briefcase. It offers disk storage, a sizeable RAM, a standard operating system and software, an optional letter-quality printer (which will fit in the briefcase along with the computer), and a built-in modem. Another claim to fame is Gavilan's proprietary operating system and software, which are about as easy to use as anything

available on either a portable or a desktop computer. You should become comfortable with them within half an hour of first turning the computer on. On top of this, the Gavilan peripherals all connect through a docking arrangement rather like railroad cars attaching to one another, so that hooking up to a printer and external disk drive is as easy as setting the computer down and shoving the peripherals up against the back of it. Ease of use, high mobility, and full functionality are three irresistible features when combined in a portable computer.

Comments Barring any unforeseen production, support, or reliability problems, the Gavilan should sell like hotcakes. It has enough features to be used as one's only computer, it allows transfer of files between itself and larger computers under MS-DOS, and it's easy to learn and operate.

Ratings This computer is suitable for: Casual Word Processing, Casual Spreadsheeting, Low-level Data Base Management, Casual Personal Productivity, and Lengthy Telecommunications. *Software Availability:* Good. *Ease of Use:* Excellent. *Compatibility:* Fair. *Portability:* Portable.

Teleram 3000

Teleram Communications Corp., 2 Corporate Park Drive, White Plains, NY 10604. (914) 694–9270.

Features *Size:* 13″ wide, 9½″ deep, 3″ high; weight 9 lbs. *Display:* 4 lines of 80 chars. LCD display, adjustable angle. *Keyboard:* integral; 83 keys including separate numeric keypad, 16 preprogrammed function keys, cursor keys on keypad. *Processor:* low-power Z80L. *RAM:* 64K, not expandable. *Mass storage:* bubble memory, 128K capacity. *Interfaces:* RS-232 serial port; proprietary high-speed parallel bus connection. *Software:* CP/M 2.2, utilities, telecommunications software. *List price:* $2495. *Options:* Model 2 with 256K bubble memory, $2995; T3500 Office Station, $1995; floppy disk drive with Perfect Writer, Perfect Speller, Perfect Calc, $895; acoustic couple, $189; canvas shoulder bag, $75.

Quality The Teleram 3000 is the latest in a series of newspaper portables produced by Teleram over the past ten years. Wire service reporters and sports writers have been carelessly banging Teleram's Portabubble and its fellows around for some time now, and they are still quite popular. Appar-



Photo 6-13. Teleram 3000.

ently they can stand up to a certain amount of in-the-field abuse.

The lack of moving parts helps. Teleram is one of the few computers sporting a bubble memory. This is a chunk of plastic that holds bubbles of electrical charge, acting as a substitute for disk drives. Bubble memory is expensive: $500 for 128K of storage capacity (an entire disk drive costs that much, and permits an endless stream of $2 floppy disks storing 185K or more). But bubble memory has certain advantages. With no moving parts, it can't break, resists jarring, and is impervious to dust and weather. It needs no power at all to retain its memory, and it doesn't take up much room.

The Teleram 3000 is as sturdy a unit as we've seen. The keys give the impression of being able to take whatever you can dish out. The 9 pound weight is considerably more than it sounds. An ad shows someone using one hand to take the Teleram out of a (large) briefcase. Forget that; it takes two hands. But at least it's not going to blow away.

A certain amount of effort has been expended to connect the machinery and the software. The function keys are preloaded with software functions.

Operation and Friendliness This is intended as a text entry computer for people writing about events while on the scene; i.e., it was made for wire service reporters. As a text editor, the machine can be made very friendly indeed. When you

buy the computer, if you pay extra for the wire service model, they'll put in WordStar specially modified for the Teleram, with the 19 function keys engraved with the WordStar commands. "Reporters like it because they don't have to read the manual," said a company spokesman. "They just push the buttons." Can't get much friendlier than that.

This is a CP/M machine, and while it looks different from the desktop models you may be used to, it thinks it's just an everyday Televideo 920 terminal, so you need no mental adjustment—or software adjustment—to operate this computer.

Using the bubble memory is just like using a disk drive: call up a file, work on the file, put the file back in bubble memory. Bubble memory is not noticeably faster than a disk drive. The bubble's seek and access time are nil, but the transfer rate is much slower than for disk drive.

You can plug the Teleram in for power, or run it three to eight hours on batteries. We got over six hours from a charge during testing. Recharging takes twelve hours, and you can use the computer while it is recharging. A light shines when the battery is low. The 4-line LCD screen tilts up at whatever angle you desire. While four lines isn't much, we like the 80 characters on each line. The screen is easy enough to read.

There are instructions for connecting the Teleram to another computer for downloading software or text files, and we managed to generate a one-way hookup: our computer could make things appear on the Teleram screen, but not the other way around.

The keyboard seems fat, somehow. It is jammed to the gunwales with keys. Some of them are in peculiar places. The "return" key is small and up too high. On one model, its place is taken by a key with a copy editor's ¶ (paragraph) symbol; possibly this inserts two "returns" at one stroke. The "backspace" and "tab" keys are below, next to the space bar, instead of on the top two rows. Bet that takes getting used to. The "control" key, on the other side of the space bar, is also tricky to use with one-handed codes because it's at the wrong angle. Clearly the designers expect the users to use those function keys rather than the control key. What they fail to notice is that some touch-typists *prefer* control codes because function keys require you to remove your hands

from the home keys, throwing you off your typing. Single-code function keys are for two-finger typists—like most keyboard designs.

Cursor control is complex, because the display is a 4-line window on a 24-line logical screen. There are keys to move the cursor and keys to scroll the screen. It makes sense, but takes a while to get used to. The keyboard also has an audible keyclick that can be turned off.

In sum, the keyboard is a little stiff and crowded and not to our taste. You have to get used to it. But it's obviously of quality manufacture, well debugged, and well thought through as a writer's traveling tool.

Software CP/M 2.2 and the communications program are the only standard software. The latter, called TeleTALK, is a full-featured, menu-driven program for signing onto data bases, dumping data files in desktop computers, or loading programs. Virtually anything that runs on CP/M can be provided by Teleram, mainly by connecting your portable to a desktop unit and transferring the software into the bubble.

If you want any kind of serious software collection, though, you'll quickly run out of bubble space, so you'll need the desktop floppy disk unit or another computer to work from. Teleram sells a floppy disk for $800 that includes Perfect Writer, Perfect Speller, and Perfect Calc—a step down from WordStar, but it's free. Teleram also sells a $2000 desktop unit designed to connect to your Teleram and provide everything you left on the desktop when you picked up the portable: a large CRT, a pair of disk drives, and connectors for more hardware.

The main trouble with software operation in this computer is that the LCD screen "follows" the cursor wherever it goes. A typical WordStar screen has a status line at the top of the screen which the cursor positions by line and character. When you type in WordStar, the cursor goes to this status line after every character, to update these numbers. On a CRT, you don't notice this constant updating; but the Teleram chases after the cursor, resulting in a constant blur on the screen all the time you're typing. This was terribly annoying. A Teleram official said a special form of WordStar is distributed to the wire services that eliminates this top-line refresh. If you don't have access to that, we recommend

you use only a word processing program that doesn't have a status line, if there is such a thing.

Documentation The Teleram system documentation is pretty good. It assumes you know nothing, and takes you through an elementary introduction to the machine and CP/M. It contains a thorough step-by-step tutorial to CP/M, which is a good thing because Digital Research's CP/M Reference Guide, also included, is incomprehensible. The Teleram manual lucidly explains how to define your function keys for each program.

The TeleTALK manual is also clear, but this powerful, multifaceted communications program defeated us anyway: we only got partially hooked up to our personal computer and stalled. Besides the tutorials, there is an interesting but heavy-duty appendix on RS-232 communication principles. Despite our failure with the computer hookup, we've got to give Teleram's documentation high marks. We were able to read almost the whole thing: quite an accomplishment.

Reputation/Reliability Teleram has been making these things since 1973, which must make it the oldest portable computer maker in the business, or nearly. They also have more field experience with the working writer than anybody, with more than five hundred newspapers, wire services, and magazines using their systems, mostly the 15-pound Telebubble.

Bubble memory stands up to more abuse than any other form of storage. It also has a lower data error rate than disks.

Claim to Fame This is the little brother of the Portabubble, the portable used in the news business.

Best Idea Ease of use because of integration of word processor and hardware.

Worst Idea The loud clicking noise every time the bubble is accessed.

Comments This is a portable with a specific purpose: in-the-field text editing for people on the go (although you want to have a table to put it on: this is no lap computer, despite the advertising campaign). It's rugged, and if you get Teleram's text editor and engraved keycaps, it's quick and easy to use.

On the down side, the jumping-bean screen display with unmodified WordStar is very tiresome. Also, it weighs a ton. Those five ordinary D-cell batteries inside make 9 pounds

seem like a lot. Furthermore, this computer is really not much good for anything other than writing.

If you need a sturdy, bullet-resistent portable and have some place to put the text when you get back to the office, the Teleram may do the job for you, especially in the 256K bubble size. On the other hand, at $2995 for the 256K bubble, you'll need to think hard about whether a $999 Model 100 or Nec 8201 can do the job just as well.

Ratings This computer is suitable for: Casual Word Processing, Casual Spreadsheeting, Low-level File Management, Casual Personal Productivity, Brief Telecommunications, and Simple Programming. *Software Availability:* Good. *Ease of Use:* Good. *Compatibility:* Fair. *Portability:* Portable.

Notebook Reviews

The HX-20 Notebook Computer

Epson America, Inc., 3215 Kashiwa Street, Torrance, CA 90505. (213) 539–9140.

Features *Size:* 11½″ wide, 8½″ long, 1¾″ thick; weight 4 lbs. 2 oz. *Display:* 4 lines of 20 chars.; LCD. *Keyboard:* QWERTY-typewriter-style, auto-repeat; 68 full-sized keys, 5 function keys, 32 graphics characters; key-selected, 10-key numeric pad; 7 switch-selectable foreign character sets. *RAM:* 16 K, expandable to 32K with 3-pound add-on unit. *ROM:* 32K; expandable internally to 40K; expandable with add-on to 64K. *Mass storage:* microcassette (built-in), approx. 50K per cassette. *Interfaces:* RS-232C serial port, parallel port; external cassette jacks, bar-code reader jack, AC power jack (power supply included). *Other features:* Internal clock/calendar, sound generator. *Software:* SkiWriter word processor, MBASIC (in ROM), Bonus Pack (microcassette) with 10 games (poker, hangman, etc.) and 9 utilities (telephone list, memo writer, event timer, loan amortization, net present value, etc.). *Other features:* built-in, 24-column, dot-matrix printer, prints 41 lines per minute. *List price:* $795. *Options:* Battery-powered external modem, $185; interface cables $25–$30; expansion unit with 16K RAM/32K ROM, $150.

Quality A rugged, well-constructed unit, the Epson comes in an attaché-like plastic briefcase that promises far more protection than the Radio Shack Model 100's vinyl pouch.



Photo 6-14. HX-20 Notebook Computer from Epson America, Inc.

But in its case the Epson won't fit inside a standard briefcase because it's almost as big as a briefcase itself. The HX-20's cover is made of high-impact plastic.

The LCD display is quite clear and surprisingly fast. The keyboard keys are sculpted and have a good feel. Altogether, a clean, classy-looking design.

Operation and Friendliness Within the limits of its operating system and size, the Epson has been made quite friendly. When you power up you get a menu from which you choose SkiWriter (for word processing), the machine language monitor (for serious programming), or BASIC (for easier programming). Up to five additional BASIC programs can be added to the menu by name, as can Bonus Pack cassette programs, making program startup easy. Printing and storing on the cassette are also done through the menu. You can move between programs at any time by returning to the main menu, and your BASIC and text files are retained in RAM automatically until you store them on cassette.

A "help" key assists you when you've made an error. It's strictly for errors, though, and is of no help in explaining anything else. Still, any *Help* utility in such a small computer is impressive.

Software Long sold without a serious text editor (or any other software, for that matter), the HX-20 now comes with

SkiWriter, which is certainly an adequate word processor for a computer of this size. It features *Wordwrap, Insert, Delete, Search, Copy Block* and *Delete Block*. SkiWriter lets you get around the document quickly, which is particularly important with such a small display: you can scroll up or down by line or by screen (although not by paragraph or by page). The "home" key moves the cursor from the top to the bottom of the document in one keystroke.

The formatter only permits you to specify line spacing and left/right margins. These values can be changed line-by-line, though, with the new values displayed on an on-screen format line. The limitations of the formatter don't seem severe when you consider that few people will attempt to write the Great American Novel on this machine anyway.

As it is, the microcassette file management of SkiWriter is designed for people with a few longish documents, rather than a bunch of smaller ones. You can have one document in RAM at a time, and you can store only a limited number of documents on each microcassette: exactly three per side of a 30-minute microcassette, regardless of the length of the documents. This is because the software partitions the microcassette into three segments, and only lets you store documents by number: 1, 2, or 3.

The way this file storage system works, three one-page letters would "fill" one side of a 30-minute cassette, though this uses only about half the available storage space. Of course, you can always use a 60-minute cassette, for which you are allowed five file spaces instead of three.

The Epson manual recommends against using the 60-minute cassettes because it takes so long to get from one end of the tape to the other. It's bad enough when you're in "fast forward" or "rewind," but when you consider that it takes close to five minutes to load or save just one 16K file, you'll begin to wonder whether having the cassette is worth it at all.

The Bonus Pack includes all the usual low-level games, such as poker, blackjack, bomber, and hangman. Some use the Epson's graphic characters, others don't. The 9 utilities included allow you to time sports events, display the day and time from a built-in 24-hour clock, write and store brief memos, make brief lists, maintain a small telephone directory, use the 10-key pad like a sophisticated calculator, figure

loan amortization schedules or the net present value of future investments, and calculate the number of days between dates in the year. You can store up to five of these programs in the Epson's RAM at once and have them listed on the main menu for easy loading if you use them frequently.

The Microsoft BASIC supplied with the HX-20 is well-documented and easy to use. The 500-page tutorial and reference manual supplied with the computer covers basic and intermediate programming in a way that will be fairly easy for a computer novice to assimilate. It could have been better with more actual program examples to illustrate some of the concepts, but one assumes that anyone serious about learning BASIC will be fairly diligent.

Documentation The documentation is larger than the computer, running 700 pages (500 of them on BASIC programming), including separate manuals on the word processor and on the operation of the cassette. The manuals are simple and friendly, getting you started very quickly. Unfortunately, they stop at the beginner level, leaving advanced and even intermediate topics unaddressed. The indexing is only fair.

Reputation/Reliability Epson is a large Japanese firm, a division of the same conglomerate that operates Seiko. Epson invented small, high-speed printers for use during the summer Olympic Games in Japan in 1964 and has dominated the dot-matrix computer printer market for microcomputers since the Apple was invented (although its dominance appears to be slipping these days).

Epson got its reputation from its inexpensive, feature-packed, and reliable printers, and the HX-20 computer follows the trend. It comes with a ninety-day warranty, and can be returned to any authorized Epson dealer for service, though the dealer will undoubtedly send it to Epson's Service Department in California, which will mean a few weeks without your computer.

Claim to Fame The Epson is alone among notebook computers in offering a built-in microcassette and printer. It is also the smallest of the units reviewed.

Best Idea The unit's low price and built-in mass storage.

Worst Idea The lack of software integration.

Comments It's tough being the first in an industry like this. As we see it, the HX-20 was designed too early, before the marketplace had decided just what a superportable com-

puter needed to do. Epson decided that having (limited) printer capability and a microcassette for storage were more important than a larger display. Subsequent competitor success suggests otherwise. Further, Epson has long lacked software (a problem now rapidly being addressed) and continues to suffer from a cumbersome telecommunications problem. Epson's experiences probably helped Radio Shack and NEC in designing their notebook models.

Regardless of its problems, the HX-20 is a sturdy, well-made machine that still looks and feels more solid than its competitors and is a little less expensive. The keyboard is excellent. The display is surprisingly fast for LCD: normally you can get one or two lines ahead when entering data on this kind of display, which is distracting, but the Epson rarely lags by more than a few characters.

In using the HX-20 you immediately see the difference in design philosophy from the other notebook models. By including both a printer and mass storage in the form of a microcassette, Epson has clearly attempted to offer all of the features of a large computer.

But the attempt requires a compromise, and it appears in the display. The Epson's display is one-fourth the size of the other notebook displays (20 characters by 4 lines versus 40 characters by 8 lines). This forces a decision on what the buyer needs most: display size, or a limited printer and cassette storage ability.

The display will scroll sideways across a "virtual screen" limited by available RAM. With the 16K standard memory, this works out to about 70 characters by 20 lines. Unfortunately, this virtual screen is only available in BASIC, not in the word processor where it would have done the most good. On the other hand, our feeling about displays is that anything smaller than half a page is inadequate anyway, and that the difference between 20-by-4 and 40-by-8 isn't really that significant.

Far more disturbing is Epson's hardware/software integration, which limits the basic machine's functionality as a portable. Both the communications software and the word processing software come in option ROMs. Since there's only one option ROM port in the basic unit, they're mutually exclusive: you can't send text files stored in RAM over a

modem. The way Epson gets around this problem is to include an extra option ROM port in the 16K expansion unit. Thus, if you plunk down $150 for the 3-pound expansion unit that increases the size of the computer by a third and almost doubles its weight, you can have roughly the same telecommunications ability that you have in the 4-pound Radio Shack Model 100.

This inability to perform the rather obvious and useful function of sending text files by phone without the added expense of the 16K expansion unit virtually destroys the Epson's size advantage. If you want the same capabilities as the $1140 Radio Shack unit that weighs less than 4 pounds, you have to spend $945 on a pregnant Epson with the add-on unit that weighs nearly 8 pounds. As we see it, the HX-20 is most useful to those requiring a portable computer largely for simple programming, personal productivity, or light word processing. Anyone planning to do a lot of word processing, data base management, or telecommunications should look elsewhere. File management is made tedious by the slow microcassette, and while the word processor is adequate, uploading the resulting text files to another computer from a remote location (or any other form of telecommunications) is impossible without the cumbersome RAM expansion unit. Since small size, light weight, and all-in-one design are the most desired characteristics in notebook computers, we find that the Epson HX-20 doesn't fill the bill nearly as well as its competition.

Ratings This computer is suitable for: Casual Word Processing, Simple Programming, Brief Telecommunications, Casual Personal Productivity. *Software Availability:* Poor. *Ease of Use:* Good. *Compatibility:* Poor. *Portability:* Portable.

PC-8201A

NEC Home Electronics, 1401 Estes, Elk Grove Village, IL 60007. (312) 228–5900.

Features *Size:* 12″ wide, $8\frac{1}{2}$″ long, $2\frac{1}{2}$″ thick; weight 4 lbs. *Display:* 8 lines of 40 chars.; LCD. *Keyboard:* 67 keys, including cursor control keys and 5 (10 shifted) function keys. *RAM:* 16K, internally expandable to 64K; also expandable with plug-in 32K RAM packs. *ROM:* 32K, internally expandable to 64K. *Mass storage:* None, although cables for external cas-



Photo 6-15. NEC PC-8201A.

sette recorder are included with unit. *Interfaces:* two serial ports, parallel port, bar-code reader port; AC power input. *Software:* BASIC, text editor, telecommunications in ROM, 15 applications programs on cassette. *Other features:* sound generator; clock/calendar; alkaline batteries with 18-hour battery life; built-in NiCd backup batteries maintain RAM for thirty days when computer is not in use. *List price:* $795. *Options:* 8K RAM chips, $120; 32K RAM packs, $395; AC adaptor, $20; printer, $170; modem, $80.

NOTE: This computer is made for NEC by Kyocera, the same Japanese company that makes the Radio Shack Model 100. The two computers are very similar. You'll be able to understand the differences better if you look at the Radio Shack review.

Quality This is a well-made computer that has a more polished looking case than the Radio Shack Model 100. The color scheme is more pleasant, and the keys have a smoother surface. These advantages are purely esthetic and doubtless quite subjective.

The NEC comes with little plastic plugs for all of its interface ports, which is a nice, quality touch; but then you

have to worry about what to do with them when you take them out to use the interfaces. Everything on this computer worked exactly the way it should, and everything looks as if it will hold up for a long time.

Operation and Friendliness Like the Model 100, the PC-8201A is very easy to set up and use. You simply turn it on, choose an applications program from the menu, and begin computing. The angle of the LCD display can be adjusted with a little wheel at the side of the computer, and the computer itself slopes from about a $1\frac{1}{2}''$ height in the front to a $2\frac{1}{2}''$ height at the back, so the screen is at a better angle to begin with than it is on the Model 100.

The NEC has a slightly different keyboard layout than the Radio Shack unit, which has both advantages and disadvantages. On the plus side, the NEC has its cursor control keys in a diamond-shaped cluster, which is the most natural formation and will be far easier to use than the Radio Shack's four-in-a-line group. Also, the NEC has 5 shiftable function keys, for a total of ten functions available, while the Radio Shack model has only 8 single-purpose keys.

On the negative side, the NEC has only one "graphics mode" key, which means it will produce fewer graphics characters at a time, and it doesn't have a shiftable numeric keypad as the Model 100 does. Also, the "control" key on the NEC is the same size as the regular letter keys (the Radio Shack's is as big as the larger "tab" key), which makes it slightly harder to hit. This is particularly important because a lot of the editing and quick movement commands are performed through "control-key" combinations. Finally, the "backspace" key is up above the row of number keys on the NEC instead of its normal position at the end of the top row. It may well be that the key differences won't matter much to you. You'll have to try the keyboard out to be sure.

Beyond these external features, though, the NEC has some decided internal advantages over its Radio Shack competitor. It comes with 16K of RAM in its minimum configuration (the Radio Shack offers only 8K), and the RAM can be internally expanded to 64K, as opposed to 32K for the Model 100. Furthermore, you can plug 32K RAM cartridges into the side of the NEC, which can give you a total of 96K of RAM available at a time. The computer comes with utility programs that allow you to partition the RAM into banks

and copy data between them, so you could write a long document using the internal RAM and then switch it out to a RAM cartridge, which could then be removed for off-line storage. The RAM cartridges have their own batteries that will maintain the memory for about six months, and you can plug the AC power adaptor directly into the RAM packs when you change the batteries, so you don't lose your data during this process. In effect, having removable RAM cartridges is like having a very fast cassette storage device. The problem is that the 32K RAM packs cost $395 each, which is a lot more than cassettes.

Another hardware advantage is the NEC's interfaces. It has a floppy disk interface as well as serial and parallel ports. NEC will soon be offering external disk drives as well as an external video interfacing capability.

The only serious trade-off NEC makes in offering the RAM packs and extra interfaces is that it uses up so much internal space that there's no room for a built-in modem. NEC offers an external modem, and they frequently throw it in with the computer at no extra cost, but you nevertheless have to lug an extra piece of gear around with you.

Software The PC-8201A comes with BASIC, a text editor, and a telecommunications program in ROM. They are displayed as options on the menu when you turn the computer on. There's also a cassette tape included which contains 15 application, utility, and game programs.

The BASIC is essentially the same Microsoft BASIC you get with the Radio Shack computer. It offers the full range of commands, operators, statements, variables, and constants you would expect to find in a good BASIC language. The NEC's version of BASIC has some advantages over the Radio Shack's. Most importantly it includes a built-in line renumbering function, which is extremely helpful when you edit a program, and a *Locate* command to position the cursor. Many of the common BASIC commands like *Load*, *Save*, *List*, *Run*, and others are available through the function keys.

The text editor is identical to the one on the Radio Shack machine, except that it's made slightly easier to use here because of the improved cursor key layout. This is not the world's fanciest text editor, but it's certainly adequate for the kind of text processing you'll be doing on a notebook computer. You can only see 8 lines of 40 characters at a time,

but you can scroll a screen at a time or jump quickly to the beginning or end of the file using "control-key" commands. The editor allows you to insert, delete, cut, copy, and move text by shading the area you wish to work on. You can set tabs, separate paragraphs, and set the width at which the text will be printed out. The cassette tape NEC throws in with the purchase also contains a formatter program that lets you set the top, bottom, left, and right margins of the text and choose the location of page numbers.

Still, this isn't exactly a powerhouse combination for preparing important documents. We're not even sure it's worth the extra trouble to use the formatter program on text you create, as it lacks the features you need and expect from a full-fledged word processing program. Our feeling is that even with the formatter, you'll still be formatting your important text on a larger computer. Some of the editing commands, like *Cut* and *Copy*, aren't available through the function keys, which makes them slightly less convenient than they are on the Radio Shack Model 100.

The Telcom program, likewise, performs very much as it does on the Model 100. You can set communications parameters, upload and download information from or to your computer, or log on to other computers automatically, and do all of these very easily. Like the other built-in programs, the Telcom performs its main operations through the function keys. There's a utility program on the cassette called the Terminal Mode Accessor, which allows you to store different communications parameters for different computers you call, and then access them quickly by name. Since many computers have different communications parameters, this is a big plus. On the Model 100, you have to change the parameters manually each time you call a computer with a different setup.

The applications programs supplied on the cassette are almost uniformly useful and friendly. The cassette is divided into three groups: business programs, utilities, and games. In the business section, there's a program that turns the PC-8201A into a memory calculator with lots of the functions of the fancier hand-held calculators. The text formatter (discussed above) is also here. There's a scheduler program here that resembles the one built into the Radio Shack computer, except that this scheduler allows you not only to store ap-

pointments and reminders, but also to set an alarm with the built-in clock and tone generator so that the computer will beep to remind you of your appointments. This is a particularly nice feature of the scheduler that is difficult to recreate (by writing your own BASIC program) on the competing Model 100. For the finance-minded, the business section is rounded out with: an investment portfolio storage and management program that calculates the current value of your portfolio, percentages of various stocks in it, and compares valuation increases and decreases; a loan evaluator that produces complete payback schedules and amounts based on the amount borrowed, the interest rate, and the term; and a linear forecaster that creates line or bar charts from data you enter.

The utilities programs on the cassette help you to use or enhance various capabilities of the computer. There's a character definer that lets you define keyboard characters if you're not happy with the ones supplied. There are three memory management programs that let you access, backup, or transfer data between the different RAM areas available. There's a program for the bar-code reader port that reads three different kinds of bar codes. Finally, the terminal mode accessor program that enhances the Telcom program is in this section.

There are three games supplied on the cassette too. First is a music program that lets you create, store, and play back musical tunes. This is a fairly flexible program that lets you change the time signatures of pieces easily, or even transpose them to other keys. The other two programs are action games called Tank and Snake.

Documentation The PC-8201A comes with three manuals: a User's Guide, a Personal Applications Kit Guide, and a BASIC reference manual. All three manuals appear to have been written in English by someone in Japan, but they don't suffer from the inscrutability common to manuals with such origins. There is an occasional awkward sentence, but it's never difficult to understand what's going on.

The User's Guide is a 150-page overview of the computer's features, operation, and built-in programs. The first half of the book gives you the nitty-gritty about the various parts of the unit, its memory capacities, battery lives, user precautions, features, interfaces, and peripheral devices. The second half of the book discusses operation of the computer

and gives startup guides to using the three built-in programs. The manual is easy to read and seems quite complete.

The Personal Applications Kit Guide is a manual for the 15 programs supplied on the cassette. Depending on the complexity of the individual program, sections covering use of the programs run anywhere from five to over twenty pages. This book assumes you know how to use the computer enough to load programs into it, but then gives you everything you need to know from there on.

The BASIC Reference Manual is 250 pages covering all the capabilities of the BASIC supplied with the computer. It explains each command in detail and offers an index for quick reference. This is not a tutorial on BASIC, however.

Reputation/Reliability NEC is another giant Japanese firm that makes computers, cash registers, printers, display monitors, communications equipment, and other electronic goods. NEC's worldwide sales are about $5 billion a year. NEC has been making computers for a long time, but has only sought to penetrate the U.S. market in the past couple of years. The company has a good reputation for quality throughout its product line. In fact, NEC's Spinwriter letter-quality printers are widely regarded as the price/performance standard of the personal computer industry. The NEC PC-8201A comes with a ninety-day warranty.

Claim to Fame The big advantages of this computer are its small size, RAM expandability and RAM packs, included software, and $795 price tag. These things put it with the Epson HX-20 at the bottom of the price heap while raising it on top of the RAM and software heaps.

Best Idea Removable RAM packs. (If only they were cheaper.)

Worst Idea Leaving out the modem.

Comments The NEC PC-8201A is an excellent value, representing what will doubtless be only the first salvo in a price/performance war among notebook computer manufacturers. Expect to see RAM sizes and software selections rise during the next year while prices fall. If you need to buy now, the choice between the NEC and the Radio Shack computers isn't an easy one. The NEC gives you plenty of RAM, lots of applications programs, and what will be some important interfaces for disk drives and an external monitor. The Model 100 gives you a built-in modem, a slightly better keyboard, and the support of an American company with

over 8,000 dealers. It's hard to go wrong, no matter which you choose.

Ratings This computer is suitable for: Casual Word Processing, Low-level Data Base Management, Simple Programming, Brief Telecommunications, Casual Personal Productivity. *Software Availability:* Fair. *Ease of Use:* Excellent. *Compatibility:* Poor. *Portability:* Portable.

Radio Shack TRS-80 Model 100 Portable Computer

Tandy Corporation, One Tandy Center, Fort Worth, TX 76012. (817) 390–3011.

Features *Size:* 11⅝″ wide, 8¼″ long, 2″ thick; weight 3 lbs. 14 oz. *Display:* 8 lines of 40 chars., LCD. *Keyboard:* QWERTY-typewriter-style, auto-repeat; 56 full-sized keys, 12 function keys, four cursor keys, key-selected numeric keypad; 128 graphics characters (including 32 foreign characters). *RAM:* 8K or 24K versions, with optional internal expansion of 8K for total configurations of either 16K or 32K. *ROM:* 32K, expandable through add-in ROM port on underside of machine, but no add-in modules available at this writing. *Mass storage:* none. *Interfaces:* RS-232C serial port, parallel port, bar-code reader port; external cassette jacks, AC power jack; 40-pin bus connector; built-in, auto-dial, direct-connect, 300 baud modem (telephone connection cable optional). *Software:* 5 applications stored in ROM: Text Editor, Telecommunications, Scheduler, Address Book, and MBASIC. *Other Features:* 4 AA alkaline batteries for main power; battery life 1 hour/day use for 20 days or 4 hours/day use for 5 days; RAM maintained by separate, built-in, NiCd battery that recharges whenever computer is in use and will maintain 8K memory 30 days without use, 32K memory 8 days without use. *List price:* $799 (8K version), $999 (24K version). *Options:* 8K RAM expansion, $135 including installation at authorized dealer; AC power supply, $5.95; modem connection cable, $19.95; printer cable, $14.95; cassette cable, $5.95; acoustic coupler adaptor for modem (for use where direct-connect impossible), $39.95; video interface and disk drive, $799.

Quality The Model 100 is a well-made computer that isn't quite as sleek-looking as the Epson HX-20, but seems as solid. A less expensive form of plastic is used for the housing, and the carrying case is soft vinyl, but if the unit is carried under

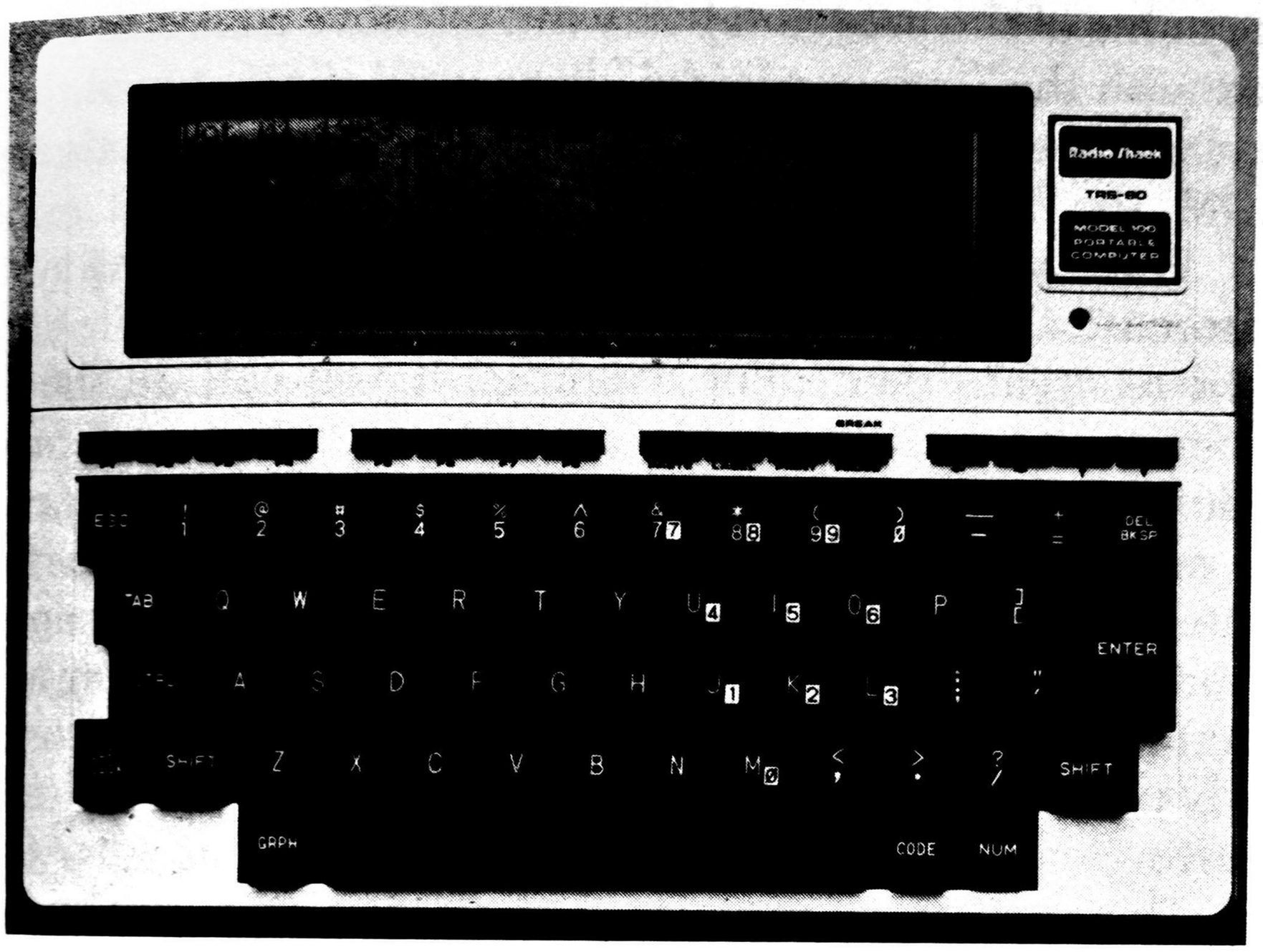


Photo 6-16. Radio Shack Model 100.

the arm or in a briefcase as it is intended, ruggedness shouldn't be a problem.

The LCD display uses large, clear letters and is adjustable for optimum viewing angle through an adjustment wheel at the side of the computer. It can also display characters in reverse, which is a help when defining blocks of text in the text editor. The keys on the keyboard seem farther apart than the Epson's, and thus a little easier to type on, but the tradeoff is that the keytops are flat instead of sculpted. The keys make a rather loud clicking sound when pressed, which could be annoying in locations where silence is golden.

Operation and Friendliness This computer is extraordinarily easy to use, and even complete novices should be happily computing within a few minutes of unpacking the unit. The secret here is a well-used row of function keys at the top of the regular keyboard and a set of applications programs that are very well integrated.

When you power-up the computer, the display shows a menu that lists the 5 applications programs, the date and time, the number of free (or available) bytes of RAM, and blank menu slots for 19 more files. As you create files, the names of the new files automatically appear on the menu. To select a program at the beginning, you can either type

the name of the program you want or move a reverse-display box with the "cursor control" keys until it's on top of the file you want, then hit "enter." Since all the applications are in ROM, the files are brought up almost instantly.

When you create files of your own, the operating system automatically knows to store them as the kind of file you've used to create them. For example, if you call up the Text program to create a document, the operating system will automatically store your file as a Text file. When you call it up again, you can load the file directly and the operating system will know to load the Text processing program automatically. The result is that you don't need to worry about what you've named files, because the names are automatically placed on the menu, and you can simply "point" to the file you want to work with using the cursor bar.

This system is far easier than the file management routines of any other computer we've seen. You can move from one file to the next at any time just by hitting a function key to return to the menu. Whenever this is done, the file you've been working on is automatically saved, so it's impossible to lose a document. Even if you turn the computer off with a file on the screen, the computer knows to store the file before shutting off.

You can store up to 19 of your own files in the RAM at once, each of which will appear on the menu. But that doesn't mean you're restricted to storing a bunch of small files. The file management system is such that files can be as long as the memory will allow, so you could have one or two big files, 19 little ones, or any number in between, as long as you have RAM to store them in.

If you ever wonder how much memory you have left, you can always return to the menu, which will automatically store the file you're working on and subtract the space it occupies from the available RAM counter. Thus, the figure for current available RAM is always only a function keystroke away. And speaking of function keys, the 8 left-hand keys are programmable, and most of them are used by the applications programs. The 4 right-hand keys, called Command Keys in the manual, are predefined and can't be changed. One of these, called "label," is used to show the current designation of the 8 programmable function keys. Whenever you're in an application, hitting "label" will cause the bottom line of the

display to show what each of the function keys is programmed for, thus eliminating the need for those troublesome plastic key overlays that most computers use to show you key functions.

In BASIC, for example, the function keys execute *Load*, *Save*, *Run*, *List*, and other program commands. In the telecommunications program, they're redefined to execute *Call*, *Status*, *Terminal Mode*, *Print*, and *Pause* commands, among others. The function key capabilities aren't doubled by hitting "shift" with a function key as they are in the Epson, so there are just the 8 possible programmable keys.

Other ease-of-use features include a battery-saving feature that shuts the display off after a specified time. The default setting is for about ten minutes, but this can be altered with a BASIC command to intervals of from one to twenty-five minutes. Both the "caps lock" and "number lock" (to activate the numeric keypad) click into the down position, so it's easy to know when you've got them on. Also, the "enter" (or "return") key is especially large, which is nice for text editing.

Software The text editor is more than adequate for this computer. The editor is always in insert mode, so you can't type over old text if you want to change things; you end up pushing unwanted text ahead of new text you enter and then deleting it at the end of your entry. Deletions can be accomplished by character, word, line, or block of text, as can other text manipulations that allow copying or moving blocks. The manipulation is simple. You activate the block definition mode with a function key, then use the cursor keys to reverse-shade the area you want to work with. Then, using other function keys to either copy or cut the block, you move it into a buffer. Cursor control is then returned to you and you can move it anywhere in the file to the place you want to copy the block to, and then hit a function key labeled "paste" to insert the block at the cursor point.

Cursor movement is very flexible. You can scroll a line or a screen at a time, and a "control-key" sequence moves quickly to the beginning or end of a file. You can also move around the file quickly by using the "find" function key to search for a particular string of characters in the file. If you wanted to go quickly from an introductory paragraph, for example, to one about gorillas, you could ask the editor to

find the word gorilla and the cursor would quickly jump ahead to the first occurrence of that word.

As for formatting, Radio Shack acknowledges the limitations of trying to print directly from such a small computer: the only format command is line length. There are no margin settings, no page breaks, no page numbers, or any of the other fancy stuff you get with full-sized computer word processors, but the assumption is that you'll be dumping the text to another computer and doing the formatting on it anyway. As it is, you can vary the line width to a maximum of 132 characters, and that's it. There's a "print" command key that will allow you to print just what's displayed on the screen, or the entire file (by hitting "shift" and "print" at the same time).

The Scheduler program allows you to create a separate Text file containing appointments you want to remind yourself of. Once a series of appointments is stored, the Scheduler program can be used to search the file for appointments by dates, keywords, special characters, or any other key you designate. The manual suggests you store all your appointments in the same format, to make it easy to search for different entries. Entries that are reminders to make phone calls, for example, can be prefaced with the Model 100 graphic telephone character, and then a search for all phone call reminders can be done simply by asking the Scheduler file to find all of those characters. The Scheduler file is also a Text file, so entries can be edited. The Text file must be named NOTE, so the Scheduler program knows where to look for appointments when searching.

Like the Scheduler, the Address Book allows you to create a separate Text file containing names, addresses, and telephone numbers. The file must be named ADRS so the utility knows where to look for entries when search functions are performed. The search function works exactly the same way as it does in the Scheduler program, and the function keys are defined with the same functions in these two programs. The difference is that Address will also interface with the Telecommunications program, so that telephone numbers stored in the ADRS record file can be searched for and accessed by the Telecommunications program for automatic dialing. ADRS can also be used to store automatic log-on routines for various information utilities.

The TELCOM Telecommunications program allows you to use the Model 100's built-in modem to connect with information utilities or other computers and exchange information. A fairly serious limitation of the modem is that it will only auto-dial in pulse mode, which means if you're using a telephone service (such as MCI or Sprint) that only recognizes touch-tones, you'll have to dial the number manually on a touch-tone phone to hook up. Using the program's "find" function key, you can search your address book for a certain phone number. If you're particularly lazy, you can also use TELCOM without the modem, as an automatic telephone dialer. Other function keys are also defined usefully under this program. In the *Entry* mode, which you are in when you first select this program, the keys allow you to find address entries, place calls, change the communications protocols (such as bit parity) to accommodate different host computers, enter *Terminal* mode, and return to the menu. (Function key "8" always gets you back to the main menu, no matter which application you're using.) In *Terminal* mode, the function keys allow you to view the previous screen (in case the computer you're connected with sends you information two screens at a time), download information from the other computer, upload information from your Model 100, switch between half and full duplex transmission modes, and hang up the phone. These programmed functions make this telecommunications program easier to use than many of the ones that run on full-sized computers, which often require "control-key" sequences to do simple things like hang up the phone or upload information.

Microsoft has implemented BASIC well on the Model 100. Its speed is comparable to that of the BASIC implemented on other 8-bit computers. Unlike the BASIC on the cumbersome Epson system, Model 100 BASIC programs can be converted into text files and edited with the Text editor, which will speed up programming. Not only that, but the program you edit in Text will automatically be reconverted to a BASIC file when you leave the Text editor.

BASIC contains interrupt commands to take advantage of the Model 100's clock, so that, for example, you can write a program that will power-up the computer at a certain time of day, activate the Telcom program, auto-dial The Source, download stock information, and then shut the computer off.

Documentation The Model 100 comes with two manuals: an 8½"-by-11", 200-page main manual that shows you setup and operations and then gets specific, and a 50-page quick reference guide that contains distilled command instructions for BASIC and the four applications. The main manual is divided into four parts. Part I shows you how to unpack and turn on the computer and then briefly describes the operation of the five built-in programs. Part II discusses each of the four applications programs in detail. Part III, which goes on for about a hundred pages, covers how to use BASIC on the Model 100, although the manual clearly warns that this section is no substitute for a guide to programming in BASIC. (You are directed to another Radio Shack reference book for instruction in BASIC programming. Still, the manual offers several useful utility programs you can create, and is organized alphabetically by BASIC command, so it should be easy to look things up.) Part IV contains several appendices that cover technical information and instructions for connecting the Model 100 to cassette recorders, printers, and other computers. There is also an index, which is fairly complete.

The documentation is well-written and very straightforward. It doesn't suffer from an overdose of cuteness and friendly drawings; it just gets you into using the computer quickly.

Reputation/Reliability Radio Shack is a division of Tandy Corporation, which began selling small computers in 1977 through its nationwide chain of retail stores. The company has been around a long time, and is noted for making fairly reliable, competitively-priced electronic products that are, well, of average quality. Radio Shack is a conservative company when it comes to computers, and has been slow to change with technological advances over the past five or so years. But the Model 100, (which was designed by a Japanese company and is, thus, the first Radio Shack computer not originating in the U.S.), is quite a different item, and should be judged as such. Service is still available at the same Radio Shack stores, but the product's reliability should be judged on the basis of its being a Japanese product. Our feeling is that since the Japanese computer giant NEC went to the same manufacturing company to have its notebook computer produced, the Model 100 is bound to be a solid performer. The computer comes with the standard ninety-day warranty,

and will doubtless need to be shipped to a central servicing point for serious repairs.

Claim to Fame The Model 100 was the first notebook computer with a display large enough to be widely considered useful, and because of its integrated software and built-in modem, it pioneers the store-and-forward concept that is sure to be the hallmark of realistic notebook computers in the future.

Best Idea The gorgeous integrated software and the built-in modem (oops, that's two ideas, isn't it?). The software makes one wish all computers were this easy to use, and pray that someday they will be. The built-in modem and its easy interaction with the other files also sets a standard for ease of use. Finally, tossing out the near-useless printer and the microcassette in favor of a larger display was a good trade-off.

Worst Idea The keyboard can be annoyingly noisy, given that this product will likely be used in meetings and other noise-sensitive situations.

Comments Radio Shack and its Japanese supplier definitely profited from Epson's mistakes here. Rather than taking the position that users would rather have extremely limited printing and mass storage capabilities on-board, Radio Shack wisely chose to assume that users of notebook computers would need a fair amount of RAM and the ability to offload files easily to other computers from remote locations, hence the built-in modem. The automatic file-naming, listing, and storage and the easy transitions between the built-in applications makes this computer extremely useful for people on the go who don't have time to look up the files they've saved and want to be able to jump into various applications immediately.

The external disk drive and video display interface option for the Model 100 were released too late for us to review. The disk drive will offer 184K of storage on a single, $5\frac{1}{4}''$ diskette. The housing for the disk drive has space for a second drive, which costs an additional $240. The video interface included with the disk drive will allow the Model 100 to display 25 lines of 40 characters on either a television or computer monitor.

The disk drive will enable users to load and save files much more quickly than they could on a cassette, but the

disk drive unit is too large to be considered portable. In addition, the disk drive has a unique format—it's not compatible with any other Radio Shack computer so you couldn't use this drive to share data between a desktop computer and the Model 100. We feel this is a serious mistake on Radio Shack's part. Essentially, this product is intended to offer Model 100 users storage and display capabilities approaching those of a stand-alone, desktop computer system. It won't have any effect on the kind of software available for the Model 100, though, because the computer's RAM can't be expanded beyond 32K. If the Model 100 is your only computer and you're satisfied with its capabilities, then the disk drive/video interface unit will give you a bigger display and more convenient storage, but don't expect it to turn the Model 100 into a desktop computer.

The Radio Shack Model 100 has set an impressive standard by which subsequent portables will doubtless be judged. Every computer magazine that has reviewed it (and there have been plenty of them) has positively raved about this computer. Reaction to a product hasn't been so uniformly positive since we can remember.

Ratings This computer is suitable for: Casual Word Processing, Low-level Data Base Management, Brief Telecommunications, Casual Personal Productivity, Simple Programming. *Software Availability:* Poor. *Ease of Use:* Excellent. *Compatibility:* Poor. *Portability:* Portable.

Chapter Seven

New Arrivals and Also-rans

As we said at the beginning of this book, the portable computer market is exploding. New computers are announced monthly. Competition for venture capital, shelf space, technological superiority, and market share is fierce, and new ideas are a dime a dozen. This chapter contains our comments about computers that are either too new for us to have evaluated completely, or too obscure to have been worth the effort of close consideration.

While new computers continue to appear, the writing of a book has to stop sometime. This is a particularly sad fact when the subject of the book is portable computers, because there are many exciting products on the horizon. The specifications and comments we make about most of these computers are based on the best information we were able to gather. Sometimes we saw a prototype of the product, and sometimes we had only written material on which to base our remarks.

While every company hopes to duplicate the successes of Kaypro, Compaq, and the Radio Shack Model 100, few of them have come within shooting distance. A far more common outcome is that new computers remain no more than a twinkle in an engineer's eye or an uninteresting proposal

on a venture capitalist's desk. Other computers do come to market because the manufacturer hasn't relied on venture capital, or because the company's investors have misjudged the product's appeal. Still others fill such small, specific needs in the computer marketplace that retail consumers seldom become aware of them. Taken together, these computers constitute the also-rans, products that have been announced and have yet to be marketed and products that are being marketed and appear only as tiny blips on the steadily rising graph of portable computer sales.

New Arrivals

Abacus

CompuSource, Inc., Minneapolis, MN. (612) 827–2951.

Comments This computer barely had been announced as of this writing. From the photo we have of it, it appears to be a transportable computer with a 9″ amber monitor, two $5\frac{1}{4}$″ disk drives, and 64K RAM. It is said to be compatible with Apple software, which will give it access to thousands of programs written for the popular Apple II computer. It also will be sold with a software bundle that includes word processing, spreadsheeting, data base management, and game programs. The announced retail price for a two-disk model is $1995. A one-disk model is $1645. The company's president says the product does not violate any of Apple Computer's patents and will therefore be free from potential lawsuits by Apple. (Apple has aggressively defended its patents and copyrights against imitators in the past.)

The information we have says CompuSource is a company of fifteen employees operating from a house in Minneapolis. We called the company and spoke with its president about a month before our manuscript deadline, and he promised to send us more detailed information, a photo, and perhaps even a prototype computer. We never received these items.

We think an Apple-compatible portable computer is a great idea—one that should be well received by many of the thousands of Apple computer fans who want more mobility. Unfortunately, CompuSource will have barely gotten off the ground when Apple's own / /*c* hits the market. A comparison

of the Abacus with the / /*c* makes the CompuSource product look pretty ho-hum.

Alec 500A

Manufactured in Taiwan, available from Comp-U-Save Computers, P.O. Box 1300, Skyland, NC 28776. (704) 274–3003.

Features *Size:* 15″ wide, 13½″ deep, 5″ high; weight 18 lbs. *Display:* 5″ green monitor (also comes with RF modulator to connect to external color television); 24 lines of 40 chars. (can also display 80 characters on external monitor). *Keyboard:* 69 standard-sized keys including separate numeric keypad. *Processor:* Apple-compatible 6502 plus Z-80. *RAM:* 64K, no internal expansion. *Mass storage:* two 5¼″ slimline disk drives, 143K capacity per drive. *Interfaces:* parallel port, RS-232C serial port; RF modulator; joystick/paddle connector, 4 peripheral external board connectors. *Software:* none. *Other features:* Apple II-compatible. *List price:* $2195.

Comments Since we haven't tried it out, we can't comment on the Alec 500's usability or quality of manufacture. We also can't comment on the maker's reputation since it's imported from a Taiwanese manufacturer we never heard of.

But this computer might be worth investigating if you need a portable, full-featured Apple. To play Apple games, just hook it up to a television set as you would a desktop Apple. To transport, simply unplug it from the television and take it away just like any transportable. The vendor tells us it's most popular among musicians who use a certain brand of music synthesizer that runs off an Apple: this portable Apple makes lugging the synthesizer around a whole lot easier.

There's an arrangement for connecting four Apple-type boards externally. The Z-80 coprocessor inside lets you run CP/M programs (though CP/M runs slower on an Apple than on a regular CP/M computer).

As with the desktop Apple, you must tolerate the small-capacity disks (143K each, compared to typical drives for other transportables of 185K and up). While the keyboard on this portable is full-sized, there is no room left over: no palm rest area, no function keys (unless there's software to utilize the keypad numbers as soft keys), and a peculiar three-key, two-handed cursor key arrangement, an all-time low in design concepts.

If you're a raw beginner with computers, you're taking a chance with a limited-distribution computer imported from overseas. Service depends entirely on the importer (they swap out boards and send away to Taiwan for them), so you'd better have confidence in Comp-U-Save of North Carolina. Experienced Apple users may have fewer qualms because of the huge third-party Apple support market on the remaining components. There is also the question of legal status with the Apple company. If they sue (and they sue everybody they think worth suing), the supply may dry up. On the other hand, Teledyne Brown Inc., a NASA contractor, bought a few of them to use in the Halley's Comet project, for what that's worth.

As we said in our review of the Abacus: an Apple-compatible portable is a really great idea and will be welcomed by Apple fans who crave portability (you've never lived until you've tried to pack up a desktop Apple). Since we haven't actually used an Alec 500, we can't say this is the portable Apple for you (and we especially caution first-timers in this regard). But it sure looks cute.

Apple / /c

Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (408) 996–1010.

Features *Size:* 12″ wide, 11½″ deep, 2¼″ high; weight: 7½ lbs., excluding power supply and LCD display. *Display:* 24 lines × 80 characters, LCD (optional). *Keyboard:* 63 keys, including two function keys and four in-line cursor control keys (layout matches Apple / /*e* keyboard except reset key has been moved). *Processor:* 65C02. *RAM:* Bank-switched 128K (64K available at once). *Mass storage:* one 5¼″ disk drive, 143K capacity. *Interfaces:* two RS-232 serial ports, disk-drive port, joystick or mouse port, video output, RGB output, audio earphone monitor. *Software:* ProDOS operating system, six-disk tutorial program. *List price:* $1295. *Options:* LCD display, about $600; external 9″ green monitor, $199; external disk drive, $329; nylon padded carrying case (holds computer, LCD, power supply), $39; mouse, $99.

Comments The / /*c* is the latest evolution of the Apple / / line, which is one of the oldest and most successful micro-

computer product lines. Old-time Apple / / owners will have decidedly mixed reactions to this unit, but newcomers are sure to love it. Apple has done away with internal expansion slots on this model, which means it won't currently run co-processors like the Z80 or 6502C, video display enhancement boards, graphics boards, or RAM expansion boards. That's the part the old-timers won't like.

What Apple is offering in exchange is built-in serial ports, a built-in floppy disk drive with an interface for another external one, either standard video or RGB color output, 128K RAM standard versus the / /*e*'s 64K, and built-in 80-column display capability that can be switched to 40 column at the touch of a button. These features were all extras on the / /*e*, and most of them required the owner to open the computer and plug a card in. This computer, in contrast, doesn't open at all—you plug its peripherals into ports at the back.

The goal behind this product is to make it easier and less intimidating than the older model, and Apple seems to have succeeded. It occupies about 60% of the space of the / /*e* and weighs less. It's far easier to set up, take down, and move around. Although its standard configuration includes neither a monitor nor an LCD display, the carrying case is designed to hold the LCD display. Since the optional display weighs less than two pounds, we expect Apple will sell lots of them, even at $500 to $600 each. The keyboard has also been redesigned—it's the same layout as the / /*e* except the reset key has been moved to the left side of the keyboard, but it has breakover keys and a fast, positive feel.

With its built-in disk drive, this product can be sold as a system-in-one-box solution that folks can take home, plug into the television, and compute away with. It will be sold with the new ProDOS operating system, which is about six times faster than the old DOS 3.3, and features an impressive disk-based tutorial that introduces people to the computer as well as to representative applications.

On the whole, the / /*c* is a first-class product, and promises to sell at least as well as the / /*e* did, although not necessarily to all the same people. With the optional LCD, it'll cost somewhere between $1500 and $2000—in about the same ballpark as PCjr and the midrange Kaypros. If you want a

business computer, you probably should look elsewhere. This one is really targeted for the home educational and personal productivity markets. It should knock the socks off PCjr in these areas.

Athena I

Athena Computer and Electronic Systems, 31952 Camino Capistrano, San Juan Capistrano, CA 92675. (714) 661–2276.
Features *Size:* 12″ wide, 14½″ deep, 3½″ high; weight 16 lbs. *Display:* 4 lines of 80 chars., LCD. *Keyboard:* integral, Selectric-style; 54 keys, no numeric keypad, 16 keys double as function keys, two arrow keys on each side of space bar. *Processor:* NSC-800 (low-power Z80). *RAM:* 64K. *Mass storage:* plug-in RAM modules starting at 128K, plus external 5¼″ floppy disk drive. *Interfaces:* parallel printer port, two RS-232 serial ports. *Software:* CP/M 2.2, JRT Pascal, Profit Plan calc program, Mini-VEDIT text editor. *Other features:* built-in, lead-acid, two-hour battery; AC/DC power adapter/charger. *List price:* $3250. *Options:* 256K RAM model, $3500; 512K RAM model, $3950; 1024K RAM model, $4950; work station with 12″ monitor; 8086/MS-DOS upgrade due.
Comments The Athena I was announced in the spring of 1983 and, as of this writing, had not gone into production. This was said to be due to continual improvements in the package. It is a transportable computer with a flip-up 4-line LCD screen. Ads show a young woman in a library, taking notes while holding the 16-pound computer in one hand—a bit of marketing hyperbole.

The computer's storage is in the form of low-power CMOS RAM, used not as RAM (as in the Radio Shack Model 100), but treated by the computer as a disk drive, a concept known as "RAMdisk." The advantage of RAMdisk is that it's quite fast compared to disks, and takes up less room. Its disadvantage is that it costs lots of money: $3250 is a lot of money for a limited-purpose computer with the equivalent of one low-capacity floppy disk aboard, especially one that runs only two hours on batteries. A separate floppy disk drive is included with the machine, used to load software and download data (the RAMdisk holds info for only eight hours when the computer is shut off).

The keyboard shows some peculiarities, like a combination "tab/escape" key, no "delete" key, a "repeat" key in the position in which the "return" key is usually found, and cursor arrow keys split up, two on either side of the space bar.

Although this computer has received a lot of press, it is difficult to see what the makers conceive to be the Athena's market. It is the only transportable with an LCD display instead of a screen, which means it must compete with the briefcase models. The lighter Teleram, in the same price range, runs eight hours on a battery charge and holds data indefinitely, yet the Athena runs only two hours and holds data for only eight. The Sharp portable has an 8-line display and a built-in printer, and costs a thousand dollars less. Other competitors for the same travel/notetaking market, like the Model 100 and NEC PC-8201, are one-quarter the price.

Barring some marketing coup, this computer may move directly from New Arrivals to Also-rans in a very short time.

Commuter

Visual Computer, Inc., 135 Maple St., Marlboro, MA 01752. (617) 480–0000. (This is the real number.)

Features *Size:* 18″ wide, 15″ deep, 3″ high; weight 16 lbs. *Display:* optional, 16 lines of 80 char., LCD on flip-up lid, or external monitor with 24 lines of 80 char. *Keyboard:* integral, identical to IBM PC except with LED lights on Caps Lock and Numeric Lock keys. Total of 83 keys including 10 program function keys and numeric keypad. *Processor:* 8088. *RAM:* 128K, expandable to 256K or 512K. *Mass storage:* one half-height $5\frac{1}{4}$″ disk drive, 360K capacity, second built-in drive optional. *Interfaces:* one parallel, one serial port, external monitor jack. *Software:* MS-DOS version 2.1. *List price:* $1695. *Options:* second disk drive; expanded RAM; built-in LCD display; synchronous RS232C communications port; terminal emulator.

Comments This is basically an IBM PC-compatible portable like the Compaq and Hyperion except with a fold-down LCD display to chop the weight to 16 pounds. This makes it the lightest PC-compatible using regular $5\frac{1}{4}$″ disk drives, an ad-

vantage because it means you can buy a lot of IBM software off the shelf instead of waiting for it to be converted to $3\frac{1}{2}$" disk or to cartridges. The keyboard is the same as the IBM's except for lights on the two keys that need them (caps lock and number lock). The LCD screen snaps down over the keyboard to make a nice, wide, flat package. At 16 pounds, you'll get farther into the parking lot before you've got to rest. Note, however, that the LCD display costs about $300 extra; otherwise this would be a steal at $1695; with a cheap $100 external monitor, it would compare with the Chameleon but for the lack of free software. Except for the peculiar carrying handle that looks like it would get in the way while you're typing, this looks like a machine worth a second look.

The Commuter Computer

Sharp Electronics, 10 Sharp Plaza, Paramus, NJ 07652. (201) 265–6500.

Features *Size:* $12\frac{3}{4}$" wide, 12" deep, $3\frac{1}{2}$" high; weight 11 lbs. *Display:* 8 lines of 80 chars., LCD; 640×80 pixel graphics resolution. *Keyboard:* 72 keys including 8 function keys and 4 cursor control keys. *Processor:* 8088. *RAM:* 128K, expandable with plug-in cartridges to 256K. *ROM:* 192K. *Mass storage:* 128K bubble; optional external $5\frac{1}{4}$" disk drive, 360K capacity. *Interfaces:* serial port, audio cassette port, disk drive port, printer port. *Software:* MS-DOS operating system, BASIC, SuperWriter, SuperComm telecommunications program. *Other features:* Clock; sound capability; internal lead-acid battery, eight-hour life; AC adaptor. *List price:* $1995. *Options:* 300 baud, auto-dial modem (fits inside case and may be used as numeric keypad), $349; two $5\frac{1}{4}$" external disk drives, $999; 64K RAM expansion cartridges, $169; 128K bubble memory, $269; internal printer (thermal transfer type, adds 3 lbs. to overall weight of unit), $399; SuperCalc2 and SuperPlanner software, $369.

Comments Our inability to closely evaluate the Commuter Computer is a great source of heartbreak to us, because this computer is definitely the shape of things to come in portables. In an 11-pound package, you get plenty of memory, 16-bit processing power with MS-DOS compatibility, and a useful display—and it costs only $1995. While not quite as functional as the Gavilan (the modem is extra, there's no

touch panel, and the software isn't menu-driven), the Commuter Computer gives you a great deal of computer punch for a low price. And for less than $400 extra, you can have a built-in, letter-quality printer.

If you spend the extra $1000 or so, you can have all the printing, communications, and mass storage you will need to perform any of the six most popular applications adequately; and because of the internal batteries and small size, you'll be able to do it almost anywhere. Expect to see a lot of briefcase portables with this basic configuration appearing within the next year or so, for this is the kind of computer that will end the market supremacy of transportable computers.

Sharp is a giant Japanese electronics firm that manufactures everything from television sets to typewriters, and from copiers to calculators and computers. The company has a good reputation for quality and reliability. Its plans are to sign up an initial 500 dealers, expanding to 1000 nationwide within a year. If you're concerned about service, Sharp says it'll be offering a twenty-four-hour air express exchange warranty plan, whereby the company guarantees you'll have a working unit in your hands within twenty-four hours of reporting a problem.

We saw a working model of this computer at the National Computer Conference during the summer of 1983 and have been dying to get our hands on one ever since. Normally the only problem that could arise with a new product like this is its ability to run software packages that have been adapted to it; but Sharp has worked with Sorcim to develop versions of SuperWriter and SuperCalc specifically for this computer, so software adaptability shouldn't be a worry.

Our warnings about waiting for products announced and undelivered notwithstanding, we think this computer is well worth waiting for if you're considering a briefcase unit. The waiting should be over by the time you read this anyway.

Eagle PC Spirit XL

Eagle Computer, 983 University Avenue, Los Gatos, CA 95030. (408) 395–5005.

Features *Size:* $19\frac{3}{8}$″ wide, $15\frac{1}{2}$″ deep, $8\frac{3}{8}$″ high; weight 33 lbs. *Display:* 9″ green CRT, 24 lines of 80 chars.; 640 × 200 pixel graphics resolution. *Keyboard:* detachable; enhanced IBM–

PC-style, with the enter and shift keys in more accessible positions; 84 keys including separate numeric keypad and 10 function keys. *Processor:* Intel 8088, with optional 8087 math coprocessor. *RAM:* 128K, internally expandable to 640K. *Mass storage:* one 5¼" floppy disk drive, 360K capacity, and one 10-megabyte hard disk. *Interfaces:* two RS-232 serial ports, one parallel port, RGB color video output port, four internal, IBM-compatible expansion slots. *Software:* CP/M-86 and MS-DOS operating systems, Microsoft GW BASIC. *List price:* $4795.

Comments This new model from a maker of desktop IBM-compatible computers is a transportable computer designed to go after a share of the hard disk, IBM-compatible market now shared by Compaq, Texas Instruments, and Corona. Eagle products to date have been reliable, if not quite as IBM-compatible as the Compaq.

HeadStart

Intertec Data Systems Corp., 2300 Broad River Road, Columbia, SC 29210. (803) 798–9100.

Features *Size:* 15" wide, 11" deep, 11" high, weight 25 lbs. *Display:* 12" green CRT, 24 lines of 80 chars. *Keyboard:* Selectric-style; 81 keys including separate cursor-control cluster and 14 function keys. *Processors:* Z80A and 8086. *RAM:* 128K, 512K, or 1 megabyte, depending on model purchased. *Mass storage:* one 3½" floppy disk, capacity unavailable. *Interfaces:* not available. *Software:* CP/M-80 and MS-DOS operating systems. *Other features:* a RAM disk feature which allows users to set up part of the RAM as a pseudo–disk drive, making possible the transfer and manipulation of data at far higher speeds than from a floppy disk. *List prices:* Model VPU 128 (128K RAM), $1895; VPU 512 (512K RAM), $3495; VPU 1000 (1 megabyte RAM), $4495.

Comments The HeadStart stands out from other transportable computers because of its 12" display screen, which is the size normally reserved for desktop computer terminals. In fact, the HeadStart was originally released as a desktop computer and then sent into the world as a portable with a shorter keyboard that snaps across the front of the monitor and disk drive.

Along with the 12" monitor, the unit's main claims to

fame are its RAMdisk feature and Intertec's local area network system. RAMdisk allows you to set part of the RAM aside as high-speed storage for programs and data when the computer is in use. The more RAM you have, the bigger and more useful the RAMdisk will be. The local area network system will allow you to link as many as 255 HeadStarts together in a network for easy data exchange and sharing of expensive peripherals, like high-speed printers and large hard disks.

Intertec Data Systems has been making desktop microcomputers for several years and has a fairly good reputation in the industry.

IBM Portable Personal Computer

International Business Machines, Boca Raton, FL 33432. (305) 998–6007.

Features *Size:* 20″ wide, 17″ deep, 8″ high; weight 30 lbs. *Display:* internal 9″ amber monitor displaying 25 lines of 80 char.; color-graphics monitor adaptor built in. *Keyboard:* detachable, same as the IBM PC with 83 keys including 10 program function keys and numeric keypad. *Processor:* 8088, same as the IBM PC. *RAM:* 256K standard, expandable to 512K; five internal expansion slots. *Mass storage:* single half-height double-sided $5\frac{1}{4}$″ disk drive, 360K capacity. *Software:* PC-DOS 2.0, BASIC. *List price:* $2795. *Options:* Second disk drive brings the base price up to $3220; printer and modem interfaces; networking system; and 8087 math coprocessor.

Comments This is essentially an IBM PC with a handle on it, and priced accordingly. You can shop around and find Compaqs on sale for $2495 that are exactly like the $3200 version of the PPC (they even look uncannily alike). This is a belt-and-suspenders portable for those who can afford to indulge their fears, and can be expected to have all the usual IBM advantages and flaws we've come to know and love: solidly built and well-serviced; overpriced; a waiting list months long; and the apple of every software developer's eye. If you want to be sure your computer maker will still be around ten years from now, and can pay for the privilege, conventional wisdom says this is what to buy. Of course, they'll sell a lot to the corporate world, where the slogan is

"Nobody was ever fired for deciding on an IBM." Personally, we like to make a dollar work harder to earn its keep.

Morrow Portable MD3

Morrow Designs, Inc., 600 McCormick St., San Leandro, CA 94577. (415) 430–1970.

Features *Size:* 19″ wide, 15″ deep, 7″ high; weight 24 lbs. *Display:* internal 5″ high × 9″ wide green or amber monitor displaying 24 lines of 80 char. *Keyboard:* detachable, 91 keys including 9 programmable function keys and numeric keypad; 30 of the keys are user-programmable. *Processor:* Z80A. *RAM:* 64K, nonexpandable. *Mass storage:* two double-sided $5\frac{1}{4}$″ disk drives, each 384K capacity. *Interfaces:* one parallel, one serial port. *Software:* CP/M 2.2, New Word word processor, spelling checker, SuperCalc, MBASIC, Pilot programming language, Smartkey keyboard customizer, Personal Pearl file manager. *List price:* $1899. *Options:* menu for CP/M; terminal emulator; multiple format reading program; networking system to link computers together.

Comments Morrow has announced a portable to complement their Morrow Micro Decision line of desktop computers that compete in the under-$2000 world with Kaypro. From the pictures, this is a handsome cream-colored machine, although we can't figure out how it's supposed to fold up for transport. It has a low profile, achieved by using a unique 9″-wide by 5″-high monitor. This gives them 80 characters on a line like everybody else while still having a low profile and relatively low weight—a clever idea. The keyboard is well considered, with cursor keys in a diamond layout (desirable, but rare) and programmable function keys that are actually programmable by the user.

The computer is compatible with the rest of the Morrow line, and with the optional disk-reading program you can read disks from the Kaypro, Osborne, Xerox 820, Televideo, and others. At $1899 it's comparable in price to the Kaypro 4, the other double-sided disk-drive 8-bit portable. The software giveaway looks better than Kaypro's, actually: New Word is a WordStar clone with a couple of extra features; Morrow's own Correct-It spelling checker is a welcome addition for writers; Personal Pearl is a sophisticated file man-

ager; and SuperCalc is the best-selling CP/M spreadsheet program. They're also handing out a sample copy of their bookkeeping system and its manual, but you have to send them some money if you try it and like it.

All in all, this looks like an attractive package from Morrow, a long-time maker of hard disk drives and what are called S100 bus computer systems (they're computers for programmers). We hope it actually comes out (at the time we heard about it, the press release couldn't decide if it had a green or an amber monitor). If a Kaypro is in your eye, give the Morrow portable a look, too.

NANO 2502

SKS Computers, Inc., 4091 Leap Road, Hilliard/Columbus, OH 43026. (614) 876–8668.

Features *Size:* 18″ wide, 15½″ deep, 6½″ high; weight 26–30 lbs. *Display:* 9″ green CRT; 24 lines of 80 chars. *Keyboard:* detachable, 18″ cord; 102 keys, including 22 (44 shifted) function keys, cursor control keys, separate numeric keypad, 8 word processing keys. *Processor:* Z80, with optional 80186. *RAM:* 80K, expandable to 208K internally with optional processor. *Mass storage:* two, 5¼″ disk drives, 400K capacity per drive. *Interfaces:* two serial ports. *Software:* CP/M operating system; Perfect Writer, Perfect Speller, Perfect Calc, Perfect Filer, CBASIC. *List price:* $2495. *Options:* 80186 processor with 128K RAM expansion; parallel port; 5 megabyte (MB) Winchester hard disk drive. *Optional configurations:* dual processors (80186 and Z80A) with two disk drives; Z80 processor with one 5¼″ drive and 5MB hard disk; dual processors with one 5¼″ drive and 5MB hard disk.

Comments This computer is manufactured in Japan for SKS. The first shipment of a few prototype models was just arriving when we went to press. This product will probably not be sold at the retail level, as SKS's background is in OEM (Original Equipment Manufacturer) direct sales. This means that SKS will sell the Nano to another marketer, which will put its own name on it, or that, if marketed under the Nano name, it will probably be sold directly to vertical markets like insurance agencies, real estate offices, and other specific industries.

Interesting aspects of the Nano include its wide, squat display screen and its 44 available function keys, which should make operating a lot of the applications software much easier, if the software is modified to take advantage of them. We were told by SKS that function keys are used with the Perfect Software packages to enable one-keystroke operation of most program functions. This will be a blessing. The function keys are also said to provide file management functions like copying disks and renaming files with a single keystroke.

Another point of interest is the optional Intel 80186 processor, which is a very fast 16-bit chip indeed. This means that if SKS can make it work, this chip will run popular MS-DOS software a lot faster than ordinary PC compatibles. The 16-bit option isn't being manufactured at this time, though, so don't get too excited. Presumably SKS is trying to establish the products one at a time, and the release of the 16-bit option will depend on sales of the standard NANO.

SKS also markets a line of desktop computers, and boasts "ten years of thorough microprocessor design expertise" in its brochures.

The Portable

Hewlett Packard, Inc., 1000 Circle Blvd. NE, Corvallis, OR 97330. (800) 547–3400.

Features *Size:* 13″ wide, 10″ deep, $2\frac{7}{8}$″ high; weight $8\frac{1}{2}$ lbs. *Display:* 16 lines of 80 char., LCD. *Keyboard:* 85 keys, including 10 function keys and 4 in-line cursor control keys. *Processor:* 8086. *RAM:* 272K. *ROM:* 400K. *Mass storage:* Uses RAM-disk. *Software:* HP Personal Applications Manager, MS-DOS 2.0, Lotus 1-2-3, MemoWriter, Terminal Program, all in ROM. *Other features:* Built-in, direct-connect, 300-baud modem. *List price:* Between $2995 and $3495. *Options:* External $3\frac{1}{2}$″ microfloppy disk drive, 788K capacity, about $800; HPIL Portable-Desktop Link, about $200; ThinkJet printer, $495.

Comments With real applications software, tons of RAM, and a nifty interface to desktop computers, Hewlett Packard leaps smack into the middle of the briefcase computer wars with what looks like a winner. The Portable is the lightest, if not the cheapest, of the briefcase portables, and it takes a different approach to portability that may be the shape of things to come.

What's different is HP's forsaking of the traditional disk drive or even RAM cartridge for on-site storage. HP is asking users to trust in the machine's RAM, which can be partitioned between on-line and off-line (RAMdisk) sections. The idea is that you can store up to 176K of files on the RAMdisk and still have 96K left for active memory. If you have fewer files and want, on the other hand, to load in another applications program, you can expand the active RAM part to 256K and leave only 16K for the RAMdisk. The division of RAM can be anywhere between these two extremes.

We're all used to the comfort of magnetic storage media, though. Somehow, trusting in the computer alone to keep data safe is a foreign concept. Hewlett Packard is trying to soften the blow by using lead-acid batteries, which are larger and heavier than NiCads, but allow for constant monitoring of their charge state. The HP's display always shows, as a percentage, how much battery life you have left. When the counter reaches 5%, the unit shuts itself off and will then maintain all files in RAM for up to 20 days or so after that. In full use, the unit will run for 16 hours continuously and recharge completely overnight.

There are a couple of alternative storage options that are less mobile. One is to buy a double-sided, double-density external microfloppy ($3\frac{1}{2}''$) disk-drive unit. The unit stores 788K on one floppy, and since it weighs in at only 5 pounds and will run on batteries, it could be considered portable.

The other solution is a lot more intriguing, though, and is really what sets the 110 apart from the crowd. Called The Portable-Desktop Link, it's a board you can order for either an IBM PC or HP 150 desktop computer. With the board in the desktop computer, you can plug the HP 110 directly into the desktop unit and then use the bigger machine's disk drives. This means you can offload your Portable's files from RAM directly onto an IBM PC or HP 150 floppy disk for instant compatibility without the hassle of transferring them through a modem or RS-232 port. Since the files created with Lotus 1-2-3 on The Portable are completely compatible with Lotus files created on an IBM PC or HP-150 using Lotus, you don't have to do any converting to use them right away. No other portable computer offers this kind of compatibility.

In this way, The Portable actually is designed to complement a desktop computer (although it will also be mar-

keted as a stand-alone solution). You can take the keyboard and RAM with you when you travel, and use the desktop unit at the office. This will mean you'll still have to use The Portable's LCD display, but users we talked to said it's as easy on the eyes in a well-lighted room as a CRT. The use of Lotus 1-2-3 and HP's Personal Applications Manager DOS interface makes the transition from lap to desktop particularly transparent on the HP 150. You can use the same software with the same commands and file structures both in the office and on the road.

As such, The Portable goes a long way toward erasing the functionality distinction between portable and nonportable computers, which is where we're all headed. Ultimately, we'll all have computers that work the same way wherever we are. If you've got about $3000, you can have one today.

Portable Professional

Texas Instruments Data Systems Group, P.O. Box 402430, H-689, Dallas, TX 75240. (800) 527–3500.

Features *Size:* 22″ wide; 18″ deep; 10″ high; weight 34 lbs. *Display:* 9″ black-and-white CRT; 25 lines of 80 char.; graphics resolution: 720 × 300 pixels. *Keyboard:* detachable, 93 keys, including 12 function keys and separate numeric keypad. *Processor:* 8088. *RAM:* 64K. *Mass storage:* one $5\frac{1}{4}$″ disk drive, 360K capacity. *Software:* MS-DOS 2.1, CP/M 86, Concurrent CP/M 86, and UCSD P-System operating systems. *Other features:* five internal expansion slots. *List price:* $2395. *Options:* Color monitor instead of black-and-white, $550; second internal disk drive, $475; extra 64K RAM, $165; 300 baud internal modem, $295; 300/1200 baud internal modem, $750; soft carrying case, $100.

Comments We think Texas Instruments' desktop computer is a much better MS-DOS machine than IBM's. It has a better keyboard with a sensible layout, a gorgeous high-resolution (720 by 300 pixels) color monitor, and the ability to hold up to 768K of RAM internally. The portable model promises to follow suit. It isn't the cheapest or lightest portable around, and you'll need TI versions of MS-DOS software to run on it, but this is about the most capable, expandable portable computer we've seen. Software availability shouldn't be a

problem, since Texas Instruments already offers or is planning to offer all of the most popular IBM software products. If you have the money to spend and don't care about total IBM compatibility, you can't do much better than this in an MS-DOS portable.

Radio Shack Model 4P

Tandy Corporation, One Tandy Center, Fort Worth, TX 76102. (817) 390–3011.

Features *Size:* 16½″ wide, 13¼″ deep, 9¾″ high; weight 26 lbs. *Display:* 9″ black and white CRT; 24 lines of 80 chars.; standard graphics resolution: not available; optional resolution, 640 × 240 pixels. *Keyboard:* detachable; 70 keys plus separate numeric keypad and 3 function keys. *Processor:* Z80A. *RAM:* 64K, internally expandable to 128K. *Mass storage:* two 5¼″ double-density disk drives, 184K capacity per drive. *Interfaces:* parallel port, serial port. *Software:* TRSDOS 6 operating system, Microsoft BASIC. *Other features:* programmable sound capability that includes audible keyclick for keyboard. *List price:* $1799. *Options:* Internal, direct-connect, auto-dial/auto-answer 300 baud modem, $149.95; CP/M Plus operating system, $200.

NOTE: This computer had not yet been released at this writing. The following comments are based on experience with Radio Shack's desktop Model 4, which appears to be identical to this computer, with the major differences being the portable housing and the smaller display screen of the Model 4P.

Quality The Radio Shack Model 4 is a fairly well made computer. The housing is solid and the seams fit well together. The nameplates and trim fit the way they should. The keyboard layout is identical to that of the Model 4. The display, while black and white, is said to be much clearer than the one on the Model 4.

Operation and Friendliness The Model 4 features a newer Z80 processor with a clock speed of 4 MHz, which is twice as fast as the processor in the old Model III. The new processor puts the Model 4's speed more in line with competitive Z80-based computers. There's also a new version of Radio

Shack's TRSDOS operating system that allows you to partition part of the computer's RAM for use as a quick-access mass storage area for data.

A Job Control Language allows you to preprogram various file management and operating system functions, which the Model 4 will then perform automatically. Finally, the unit contains a Model III ROM and comes with software that allows the Model 4 to run Model III programs. In Model III operating mode, the Z80 processor runs at the old speed of 2 MHz, and the display reverts to the Model III's 64 columns wide, instead of 80.

As to friendliness, the Model 4 is a little easier to use than an ordinary CP/M computer, because TRSDOS uses commands that are a little more easily understood. There are some drawbacks to the keyboard, though.

First of all, the "control" key is located down next to the space bar, which is an awkward location for a key that is used as much as this one is. Second, the "backspace/delete" key (called "clear" on the Model 4) is located next to the "enter" (or "return") key, instead of in the top row, which is more common. Perhaps most annoying, however, is the bizarre arrangement of the cursor control keys. Virtually every microcomputer made has the cursor control keys in one group, in a diamond pattern, 4-in-a-line, or in some kind of T- or L-shaped arrangement. The Model 4 has the right/left cursor keys on the right side of the keyboard and the up/down keys on the left side of the keyboard. It is difficult for us to imagine why Radio Shack chose such an unnatural and inconvenient arrangement, especially since there appears to be plenty of room on the keyboard to put the cursor group all in one place. If you've used another computer before, this arrangement will be very difficult to get used to. And even if you cut your computing teeth on the Model 4, we don't think you'll ever be able to move the cursor around as easily and as intuitively as you can with more traditional cursor key layouts.

Reputation/Reliability The Tandy Corporation has been making and selling microcomputers as long as anyone in the business, and it has sold more of them than anyone in the business (although other companies are catching up). Radio Shack computers have an extremely loyal following. People

who buy and use a Radio Shack computer very often turn to Radio Shack again when looking for peripherals or a second computer. In the industry at large, however, Radio Shack's computers are widely thought of as mediocre. (The exception to this is the Model 100, which is the only one of the company's computers that wasn't designed in America.)

There are a number of potential reasons for both points of view. Radio Shack loyalists point to the firm's 8800 locations in eighty countries. If you want service and support, you can get it virtually anywhere. They also point to the large selection of software available for these computers, and to the rock-solid fiscal and operating condition of Tandy Corporation, which has helped it avoid such common industry problems as shipping backlogs, wide variations in quality within the same product line, and unfulfilled promises about upgrades, peripherals, and forthcoming software for its computers.

Radio Shack's detractors, on the other hand, cite the electronics-hobbyist orientation of Radio Shack stores, and suggest that the personnel in such stores lack the computer expertise needed to support the products adequately. (Radio Shack has attempted to counter this image by setting up separate Computer Center locations that don't carry the general line of electronics goods.) Critics also point out a few poor design aspects of the products, such as: black and white monitors instead of the more acceptable green phosphor; 64-column displays instead of the standard 80; and even the old silver-gray case colors.

Radio Shack tends to respond to such perceived deficiencies slowly, if at all. But the most important drawback to Radio Shack computers is that they're designed to run most easily with Radio Shack peripherals and software. There is a wide selection of software (and a number of third-party software suppliers), and you can get some third-party peripherals to work with these computers. But your options are more limited than they would be with many other brands of computer. Generally, if you buy the computer from Radio Shack, you'll end up buying almost everything else for the computer there too.

Comments Radio Shack's large software library, widely available support, and downward compatibility with the rest

of the Radio Shack computer line are the big plusses here. The Model 4 will run all the software written for the Model III computer, most of the software for the Model I computer (depending on how it's formatted on the disk), and also CP/M programs (with the optional CP/M operating system), giving it access to well over five thousand individual software packages. If the computer breaks or you have questions, you can get them answered whether you live in New York City or Council Bluffs, Iowa.

The Model 4 is an improvement over the Model III, in terms of both looks and performance. It runs CP/M programs more easily than its predecessor. You get 3 function keys, but 10 would have been nicer. The Z80 processor runs twice as fast as the one in the old Model III, and the new version of the TRSDOS operating system allows you to allocate part of RAM as a quick-access form of mass storage. But then there's that crazy cursor key layout, and the limited access to aftermarket products like printers, disk drives, and modems.

In the end, it may well be more a matter of personal preference than of objective standards. You either think Tandy has as much business making and selling computers as they do making and selling hobby kits, intercom systems, stereo systems, and batteries, or you don't. If you're the type of person who has no qualms about the quality of other Radio Shack products, then you probably won't have any qualms about its computers.

RoadRunner

MicroOffice Systems Technology, Inc., 35 Kings Highway East, Fairfield, CT 06430. (203) 367–2525.

Features *Size:* 11″ wide, 7¾″ deep and 3″ high; weight 5 lbs., battery powered. *Display:* 8 lines of 80 char., LCD, on flip-up lid. *Keyboard:* integral, 54 sculptured keys plus cursor arrow keys, 8 program function keys and 5 dedicated function keys. *Processor:* Z80. *RAM:* 48K. *ROM:* 16K. *Mass storage:* four removable battery-powered RAM cartridges. *Software:* VT-100 terminal emulation, CP/M operating system, MicroOffice text editor, scheduler. Built-in 300 baud modem. *List price:* $1695.

Comments The RoadRunner looks like an imaginative entry

into the notebook computer sweepstakes, and bears watching. The display screen is on the underside of a top hatch that snaps shut over the keyboard, making a package that looks like a plastic hardback book. It has a built-in terminal emulation, which many businesses will like, four cartridge slots (more than most of its competitors), and is small and light. Like the Teleram briefcase computer, but unlike other lap computers, the RoadRunner uses CP/M rather than its own unique operating system. This means that existing third-party software can be more easily adapted. It even looks nice. It will be interesting to see if the marketplace decides the RoadRunner, at $1695, is a pricey Radio Shack Model 100 or a budget Gavilan.

Senior Partner

Panasonic Company, One Panasonic Way, Secaucus, NJ 07094. (201) 348–7182.

Features *Size:* 18½″ wide, 13¼″ deep, 8¼″ high; weight 28 lbs. *Display:* 9″ green CRT, 25 lines of 40 or 80 chars. *Keyboard:* detachable; IBM-compatible. *Processor:* 8088, with optional 8087 math coprocessor. *RAM:* 128K, internally expandable to 512K. *Mass storage:* one 5¼″ floppy disk drive, 360K capacity; optional second drive can be installed inside case. *Interfaces:* RS-232 serial port, Centronics-type parallel port; RGB color video output jack. *Software:* MS-DOS 2.0 operating system, WordStar, VisiCalc, PFS:File, PFS:Report, PFS:Graph, and Microsoft GW BASIC. *Other features:* built-in thermal printer capable of printing either 80 or 132 characters across standard paper. *List price:* $2495. *Options:* second disk drive, $450; 128K RAM expansion boards, $320.

Comments The Senior Partner is proof that the Japanese are getting serious about the IBM compatible market. This new transportable is said to be more compatible with the IBM PC than even the Compaq, which was felt to be as compatible as a computer could get without infringing on any patents. Panasonic is sweetening this already tempting combination of price, software, and compatibility with a one-year limited warranty, which is four times as long as most other warranties. This computer is well worth checking out as an alternative to the Compaq, Chameleon, Corona, and Columbia.

Televideo Portable Computer (TPC) 1

Televideo Systems, Inc., 1170 Morse Avenue, Sunnyvale, CA 94086. (408) 745–7760.

Features *Size:* 18″ wide, 15″ deep, 8″ high; weight 25 lbs. *Display:* 9″ yellow or green CRT; 24 lines of 80 chars., 640 × 240 pixel graphics resolution. *Keyboard:* detachable; identical to IBM PC, including numeric keypad, 10 function keys. *Processor:* Z80A. *RAM:* 64K, expandable to 128K. *Mass storage:* on slimline 5¼″ double-sided, double-density disk drive, 386K capacity. *Interfaces:* parallel port, serial port. *Software:* CP/M, and the "TeleSolutions" software package: Telewrite, Telecalc, and Telechart; GSX-80 graphics program extension. *List price:* $1599. *Options:* $1999 for two drives; networking software for about $500.

Comments This computer was in the process of being released when we went to press, and reliable information was difficult to pry loose from the marketing people. We attempted to obtain information about the computer over the course of three months, during which time the computer changed names (originally it was to be called the TeleTote, a cute name), keyboards (from a handsome, invitingly sculptured one to the IBM PC keyboard, weird keys and all), prices (several times) and even the color of its monitor (green in one ad, yellow in another).

Despite this confusion, we remain optimistic about the Televideo portable for two reasons. First, this eight-year-old firm is the leading maker of economical and solidly built computer terminals, and its two desktop computers are well regarded, with excellent screen displays and quality disk drives. Second, the publicity pictures show a gorgeous machine. It has a sturdy handle on the side, where it belongs (and nobody ever puts it), the colors are nice, the design clean, and . . . well, it's cute.

The software is all from Chang Labs, which does dependable work. Telewrite was formerly MemoPlan, a word processor with which we are unfamiliar. Telecalc was once ProfitPlan, a good calc program we discuss in the Kaypro review. And Telechart is actually GraphPlan, a very easy-to-use little program that turns your calc sheet into pie charts, bar graphs, or line graphs at the push of a button. Chang software can usually be depended on to work as advertised.

The Televideo portable is compatible with Televideo's two desktop microcomputers, and it can be hooked into a local area network (LAN). For a high-disk-capacity portable, the TPC1 is priced at a fair $1999 (two drives model) and would be worth looking at if you are in the market for an 8-bit CP/M transportable. (The company advertises it at $1599 for one disk drive, but this is strictly a marketing gimmick: get two disk drives.)

Also-rans

Commodore Executive 64

Commodore Business Machines, 487 Devon Park Drive, Wayne, PA 19087. (215) 431–9100.

Features *Size:* 14″ wide, 14½″ deep, 5″ high; weight 27½ lbs. *Display:* 5″ color CRT, 24 lines of 40 chars. *Keyboard:* 66 keys, including 4 functions keys and 2 shifted cursor control keys. *RAM:* 64K, not expandable. *Mass storage:* one or two 170K built-in disk drives. *Processor:* 6510, with optional Z80. *Interfaces:* RS-232 serial port, parallel port, external video monitor connection. *Software:* None bundled with system; compatible with software from desktop model of Commodore 64. *Other features:* sound capability. *List price:* single-disk model, $995; double-disk model, $1195.

Comments Although announced early in 1983 and promised for delivery in late summer, this computer had failed to materialize by the time we sent this book to press a year later. Aside from having seen a prototype of the Executive 64 at the National Computer Conference in June 1983, we were unable to garner anything more than a one-page flyer in the way of information. From what we have been able to determine, the Executive 64 is totally compatible with the older Commodore 64, which makes for a few problems in terms of performance and support.

First of all, the Executive is said to employ a 5″ color monitor. Color monitors of any size are inherently fuzzier and harder on the eyes than monochrome monitors, so a color monitor only 5″ on the diagonal promises to be almost torture to look at for any length of time. Second, the Commodore 64 sends and receives data from its disk drive serially, rather than in parallel as all other computers do. This means that

instead of transferring information to and from disk one byte at a time (one character at a time), it transfers it one bit at a time. Since it takes 8 bits to make up a byte of data, this means that the Commodore takes noticeably longer to load and store data from and to its disk than any other computer.

It is our understanding from talking with several Commodore dealers that the Executive 64 will, like its older brother, be mass-marketed through large-chain, discount stores. The word is that Commodore is promising its independent dealers (the guys with real computer stores) two months of exclusive rights to sell the Executive, and that after that it will be mass-marketed.

Once mass-marketing begins, the chains like K-Mart who buy carloads of computers at a time will be able to sell the Executive 64 for less than an independent dealer can buy one (the old 64 was selling for $179 at discount houses, for example, when dealers still had to pay $198 for it). This means that consumers may well take advantage of the better purchase price from the mass merchandiser, and then come crawling to the independent dealer for support (because everyone knows that the sales clerks at K-Mart don't know computers from cassette players). According to one dealer we interviewed, Commodore pointed out that such pleas for support will mean a brisk accessories and software business for the independent dealer. It may well involve more trouble than it's worth, however, for independent dealers to hold the hands of people that didn't buy the computer from them. If this proves to be the case, you can expect to see the number of independent Commodore dealers diminish rapidly, and with them, any hope of support for this product.

Perhaps none of this would matter if Commodore's products enjoyed an excellent reputation for reliability and documentation, but this is not the case. In reality, the manual for the Commodore 64 had some glaring errors in it that prevented users from performing certain functions without consulting an expert. If the experts all go away, then it will be like having a library filled with books written in Sanskrit when your only language is English. The Executive 64 is being offered at an attractive price, but when you consider the performance limitations and potentially evaporating support, a low price doesn't make the deal very sweet.

DTI Portable

Digital Technology International, 500 West 1200 South, Orem, UT 84057. (801) 226–2984.

Features *Size:* 18″ wide, 17″ deep, 8½″ high; weight 20 lbs. *Display:* 9″ green CRT; 24 lines of 80 chars. *Keyboard:* detachable; includes 16 function keys and separate numeric keypad. *Processor:* Z80A. *RAM:* 64K, internally expandable to 128K. *Mass storage:* two, 5¼″ disk drives, 400K capacity per drive. *Software:* Zedos operating system (CP/M compatible), text editor. *List price:* $3995.

Comments We responded to a press release about this computer and were told that there were only a couple of prototypes in existence. If you find the information in the *Features* section of this review somewhat sketchy, it's because this was all the information we could get. The company's representative told us that DTI was concentrating on its line of desktop computers and that the portable had been put on the back burner. Digital Technology International sells its products directly to the newspaper, book publishing, law, real estate, and printing industries. It is unlikely that you'll ever have to worry about evaluating this computer at the retail level.

DMS FOX

Digital Microsystems, Inc., 1755 Embarcardero, Oakland, CA 94606. (415) 532–3686.

Features *Size:* 18″ wide, 15″ deep, 8″ high; weight 30 lbs. *Display:* 9″ green CRT; 25 lines of 80 chars. *Keyboard:* detachable; 88 keys including separate numeric keypad, 16 function keys. *Processor:* Z80A. *RAM:* 64K, not expandable. *Mass storage:* two 5¼″ disk drives, 640K capacity per drive. *Interfaces:* four RS-232 serial ports. *Software:* CP/M 2.2, Perfect Writer, Perfect Speller, Perfect Filer, Perfect Calc, HiNet local area network software, system utilities, diagnostics. *List price:* $3995. *Options:* internal 10 megabyte hard disk, local area network linkup, accounting packages, computer languages.

Comments The Fox is part of Digital Microsystem's LAN (local area network) system that links up all the computers in a company. The Fox is the "portable" workstation of the

system, but it is not portable in the sense used elsewhere in this book. It has no handle, the keyboard doesn't snap onto the main unit, and it is not intended to be carried home at night. It's portable in the sense that it's all one piece and can be connected to the network and disconnected easily, and transferred from one part of the building to another. It's portable the way a 19″ color television set is portable; i.e., it's not bolted down.

Because of a misleading advertising campaign, the Digital people get a lot of calls from people who really want a stand-alone portable. This computer is intended to serve as part of a network, and is too pricey ($4000) even with its gigantic disk drives to be considered a good buy if you aren't planning to buy a dozen of them and set up a network. The Fox is not for the boardrooms of America, but for the warehouses and field offices.

Osborne 1

Osborne Computer Corporation, 26538 Danti Court, Hayward, CA 94545. (415) 887–8080.

Features *Size:* 20″ wide, 20″ deep, 8″ high; weight 24 lbs. *Display:* 5″ green CRT; 24 lines of 51 chars. *Keyboard:* detachable; 68 keys including separate numeric keypad doubling as 10 function keys, cursor control keys in diamond shape. *Processor:* Z80A. *RAM:* 64K, not expandable. *Mass storage:* two 5¼″ disk drives, 185K capacity per drive. *Interfaces:* card-edge parallel port, RS-232 serial port, battery port, modem port, external monitor port. *Software:* CP/M 2.2, WordStar with MailMerge, SuperCalc, MBASIC, CBASIC. *List price:* $1295 (commonly sold for $995 or less). *Options:* Modem and software, $250; 80-column upgrade, $185 plus installation; battery pack, $300.

Comments Osborne Computer Corporation appears to be on the ropes for the time being—the portable world's brightest star turned into a meteorite. As the first big victim of the long-awaited "shakeout," Osborne leaves orphans: some 150,000 current owners, and maybe 10,000 unsold computers in retail stores (not to mention more in Osborne's warehouses). The question naturally arises, Would it be a good idea to buy an Osborne now? The price is certainly right: A full-fledged, full-powered computer comparable in every way

(except the screen) to a Kaypro or Morrow, for under a thousand dollars, brand new, with top-of-the-line software.

A few comments before we answer the question. First, the Osborne is of reasonably good quality, although the disk drives don't travel that well. It is solidly built, and the keyboard is good (there are two brands of keyboard: the full-stroke standard, and the short-throw keyboard that some people like and others hate). The real question is whether you can get your Osborne repaired.

The answer to this question turns out to be yes, because in the course of going broke, Osborne Corp. had the grace to make a deal with Xerox, which repairs small computers. You can buy a one-year warranty from Xerox for about $250, which is an excellent price. Osborne's own ninety-day warranty is not honored anywhere, but that's why you're getting such a break on the price. There are also dozens of repair shops around the country that will handle the Osborne, and an ex-employees outfit called Mission Peak that will do it by mail.

But service isn't everything. What about support? In other words, who do you talk to when you need answers or solutions to your computer and software problems?

With 150,000 of them out there, Osbornes are like Volkswagen Beetles: they don't make them any more, but you'd hardly notice because the market is so large it can sustain a third-party service industry. In addition, Osborne is rich with user groups, clubs of Osborne owners who meet to exchange tips, news, and information. There was also an Osborne magazine for awhile, recently revived. The machine's manual was re-written from scratch by Osborne's staff and is a reasonably complete, chatty, hands-on tutorial on the computer and its software—much more complete than most computer manuals, although still short of the ideal (no computer company has reached the ideal).

On the other hand, with no more Osborne 1s being made, the market will drop year by year until someday you'll find it truly hard to get software and even service. For the moment, that day appears to be off in the future by several years, especially if you live in a metropolitan area where Osbornes sold well. Meanwhile, the remnants of the company are still making the Osborne Executive, and promising an Osborne PC-compatible machine some day soon.

Our answer to the question of whether it's a good idea to buy an Osborne is that if you are new to computers and not interested in working at your relationship with a computer, you should avoid the Osborne, even though the price is right. Instead, you should stick with a well-known, best-selling computer from a company likely to stay in business. (Unfortunately, this advice would have been of no use a year ago, since the Osborne 1 was itself a well-known, best-selling computer from a company . . . etc., etc. So buy an IBM.)

If, however, you are experienced with computers, like gadgets, live near a metropolitan area, and are willing to do a little work, an Osborne represents an excellent buy. It's even better if your needs are specific, focused, and unlikely to change much. Writers, for example, rarely need more than a typical computer can deliver. Despite its tiny 5″ monitor (get an external monitor), the Osborne is a good, solid computer with top-notch bundled software—the best in the business. And you can add a hard disk, a modem, and even double-sided drives to it thanks to outside vendors. But sign up with Xerox, and immediately join your local Osborne user group.

Software is still available for the Osborne, because the double-density drives on the current model read Xerox 820 disks, which have become a sort of standard for small computers (it also reads disks from the IBM PC (using CP/M-86), DEC VT-180, and Cromemco). Until recently, if a program was offered on more than two CP/M machines, Osborne was always the third. Any software which depends on an 80-character screen must be adapted to the Osborne, however, and that will take place less frequently as time goes by.

Claim to Fame The first. The first portable, the first to bundle interfaces, the first to bundle software, the first portable to publish its own magazine.

Best Idea All of the above.

Worst Idea Not the 5″ screen, as you would think, but waiting two years and never coming out with an Osborne 2 instead of the Executive.

Osborne Executive

Features *Size:* same size, weight, and case as the Osborne 1. *Display:* 7″ amber CRT; 24 lines of 80 chars. *Keyboard:* same as the Osborne 1. *Processor:* Z80A. *RAM:* 128K, bank-

switched. *Mass storage:* two half-height 5¼" disk drives, 185K capacity per drive. *Interfaces:* Centronics-type parallel port, two RS-232 serial ports, two external monitor ports. *Software:* CP/M Plus (3.0), WordStar with MailMerge, SuperCalc, Personal Pearl file manager, MBASIC, CBASIC, UCSD P-System universal operating system. *Other features:* internal fan. *List price:* $1595.

Comments Just before going out of business, Osborne introduced the Executive. Whereas the Osborne 1 found a home among writers and small business people, the Executive was aimed at the corporate world—where the real money is! Unfortunately, the corporate world wanted an IBM-compatible Executive, and Osborne ran out of money before it could release its version of a portable IBM.

Unlike the Osborne 1, Osborne Executives were not widely sold. There are fewer than 10,000 on the market, which makes the whole question of service and support for the Executive much less certain than for the Osborne 1. Xerox will service the Executive too, and the components are more standardized, which should help matters when Xerox runs out of stockpiled Osborne parts. Meanwhile, the company is still making and selling Executives.

On the plus side, the Executive has an excellent 80-character screen and is more powerful than the usual Z80 CP/M computer. It uses 128K RAM and the faster and more reliable CP/M 3.0 operating system. It comes with the P-System, an experimental "universal operating system" popular in the education world, and with the powerful and easy-to-use Personal Pearl file manager. The Executive makes a handsome package, and it might make a good buy for a more experienced user. Beginners are probably well advised to stay away unless they know somebody who can carry them over the rough spots.

If Osborne's IBM-compatible version of the Executive is released this year, it will be sufficiently interesting a package to warrant further investigation.

PC-8088

Computer Systems, 26401 Harper Avenue, St. Clair Shores, MI 48081. (313) 779–8700.

Features *Size:* not available. *Display:* 7" or 9" color or monochrome CRT; 24 lines of 80 chars. *Keyboard:* identical to

IBM PC; 90 keys, including 10 function keys and separate numeric keypad. *Processor:* 8088, optional 8087 or Z80. *RAM:* 64K, expandable internally to 512K. *Mass storage:* optional disk drives, $5\frac{1}{4}$", storage capacity unavailable. *Interfaces:* optional serial, parallel, and IEEE-488 ports. *Software:* MS-DOS operating system, with optional CP/M-86 or CP/M-80 (Z80 processor required). *List price:* not available.

Comments This computer was not available for review. The only information we were able to get on it after repeated calls to the manufacturer consisted of two photocopied flyers that were extraordinarily vague in describing this system, as you can see from the sketchiness of the *Features* list above. This computer, if the company is serious about selling it at all, appears to be a made-to-order job. Computer Systems offers so many "options" that you apparently request the kind of computer you want made, and they make it for you. Photos of this unit show the IBM logo prominently displayed on the CPU and keyboard: IBM says they know nothing about this product, and it certainly isn't a Portable PC. In our opinion, Computer Systems is trying to generate excitement about the idea of a portable IBM PC and thereby attract some capital with which to proceed with manufacture of the product. We feel the chances are somewhat less than 50 percent that this computer will ever be manufactured in anything but prototype form, let alone widely available at the retail level for your consideration.

The Small One

GMR Incorporated, 1048 E. Burgrove Street, Carson, CA 90746. (213) 639–4663.

Features *Size:* 20" wide, 16" deep, 8" high; weight: 35–60 lbs., depending on configuration. *Display:* 9" green CRT; 24 lines of 80 chars.; 512×480 pixel graphics resolution (optional). *Keyboard:* hinged but not detachable; 77 keys, including separate numeric keypad and five cursor control keys. *Processor:* Z80A. *RAM:* 64K. *Mass storage:* one $5\frac{1}{4}$" disk drive, 70–140K capacity. *Interfaces:* two serial ports, two parallel ports. *Software:* as ordered. *List price:* $3250. *Options:* If you can get it for a computer, you can get it for The Small One. The options are too numerous to list completely, but include external disk drives (both floppy and Winchester), a music

synthesizer, an S100 expansion bus, a clock/calendar, plastic or aluminum housings, 256K memory expansion, and other goodies.

Comments This is essentially a computer that GMR will build to your specifications. When we asked for an evaluation unit, GMR said we'd have to be more specific, indicating that they don't market a "standard" unit at all, but instead offer a variety of hardware and software options that they will put together to suit you. This is fine if you need something out of the ordinary, like ultra-high graphics resolution, or a heavy-duty power supply, but it's not so good if you just want a basic computer. Support will be available only through GMR in California or one of its representatives (there are no retail dealers), and because you're essentially customizing your unit, you may have the only one exactly like it in existence.

The uniqueness of the computer and the relatively small size of the company make us a little uneasy. Indeed, when we called once for further information, we were told that "everybody" we could get information from was away at a convention and would be gone for three weeks. Unless you have a specific need for a scientific or industrial application that cannot be met by a supplier of a more standard product, we don't consider it worth your time to investigate The Small One.

Toshiba T100

Toshiba America, Inc., Information Systems Division, 2441 Michelle Drive, Tustin, CA 92680. (714) 730–5000.

Features *Size:* 16½″ wide, 11″ deep, 4″ high (without LCD display attached); weight: 25 lbs. (entire kit). *Display:* LCD; 8 lines of 40 chars.; 320 × 64 pixel graphics. *Keyboard:* 89 keys, including separate numeric keypad, cursor control keys, and 8 function keys. *Processor:* Z80A. *RAM:* 64K, expandable with 16K RAM pack (included). *Mass storage:* external, two 5¼″, double-sided, double-density disk drives, 280K capacity per drive; or external audio cassette recorder. *Interfaces:* RS-232C serial port, Centronics-type parallel port, audio cassette port. *Software:* TBASIC operating system in ROM; CP/M or T-Disk BASIC available with external disk drives. *Other fea-*

tures: 300 baud acoustic modem. *List price:* $1500. *Options:* 32K RAM pack instead of 16K RAM pack, $90; extra 16K RAM packs, $195 each; 32K RAM packs, $295 each.

Quality This is a well-made unit with a good keyboard. The LCD display is as clear as any other one we've seen. With only 40 characters across, the letters are quite large and easy to read.

Operation and Friendliness In its portable configuration, the T100 is not very friendly at all. Toshiba supplies no software to run under the TBASIC operating system, so if you want this computer to do anything, you'll have to write your own programs. With the external disk drives, this computer will run a variety of Toshiba-supplied software, all of which costs extra except for CP/M and CBASIC. Of course, since you need the external disk drives to run the software, the unit isn't portable, as the carrying case is designed to accommodate only the computer/keyboard unit, the LCD display, and the modem.

Software See ***Operation and Friendliness*** for limitations to using applications software with this unit. If you elect to purchase the external disk drive unit, you can select what's called the T100 Professional Business Package (for an extra $595) that includes WordStar, ProfitPlan, and Analyst/NAD/QSort, but this assumes you'll be wanting the computer in its desktop configuration, so we didn't evaluate these packages.

Documentation The manuals for this unit cost extra. The owner's manual and the programmer's manual are $20 each.

Reputation/Reliability Toshiba is a very large Japanese firm with sales in the neighborhood of $9 billion a year. The company has extensive experience in the development and manufacture of semiconductors (computer chips), LCD displays, high-quality display monitors, printers, and other computer components. Toshiba has been manufacturing computers for thirty years. Its products have a good reputation for reliability. The T100 comes with a standard ninety-day warranty. Service is available at dealers throughout the U.S.

Claim to Fame As a portable unit, this computer has absolutely no claim to fame in our opinion. It is essentially a desktop computer that has been stripped-down to fit inside a briefcase.

Comments Apparently Toshiba had a few thousand extra T100s lying around and decided to try to up sales by offering a portable version of it. We doubt that this strategy will go very far, as the machine in its portable configuration has absolutely zero software and is, therefore, useless except for programming in BASIC. As a company, Toshiba is clearly devoting its current attentions in the personal computer marketplace to its new 16-bit desktop computer, so don't expect a lot of support and software to suddenly materialize for the T100. Frankly, we cannot recommend this computer at all, but if you insist, we suppose it will be useful for those interested in simple programming.

UDI-500

Universal Data, Inc., 3960 M-15, Clarkston, MI 48016. (313) 625–0158 or (800) 521–1056.

Features *Size:* 11″ wide, 13″ deep, 3″ high (closed); weight 10 lbs. (AC), 13 lbs. (with internal batteries). *Display:* Flip-up LCD; 8 lines of 40 chars.; resolution: 320 5-by-7 dot matrix chars.; includes 64 Kantakana (Japanese) characters. *Key-*

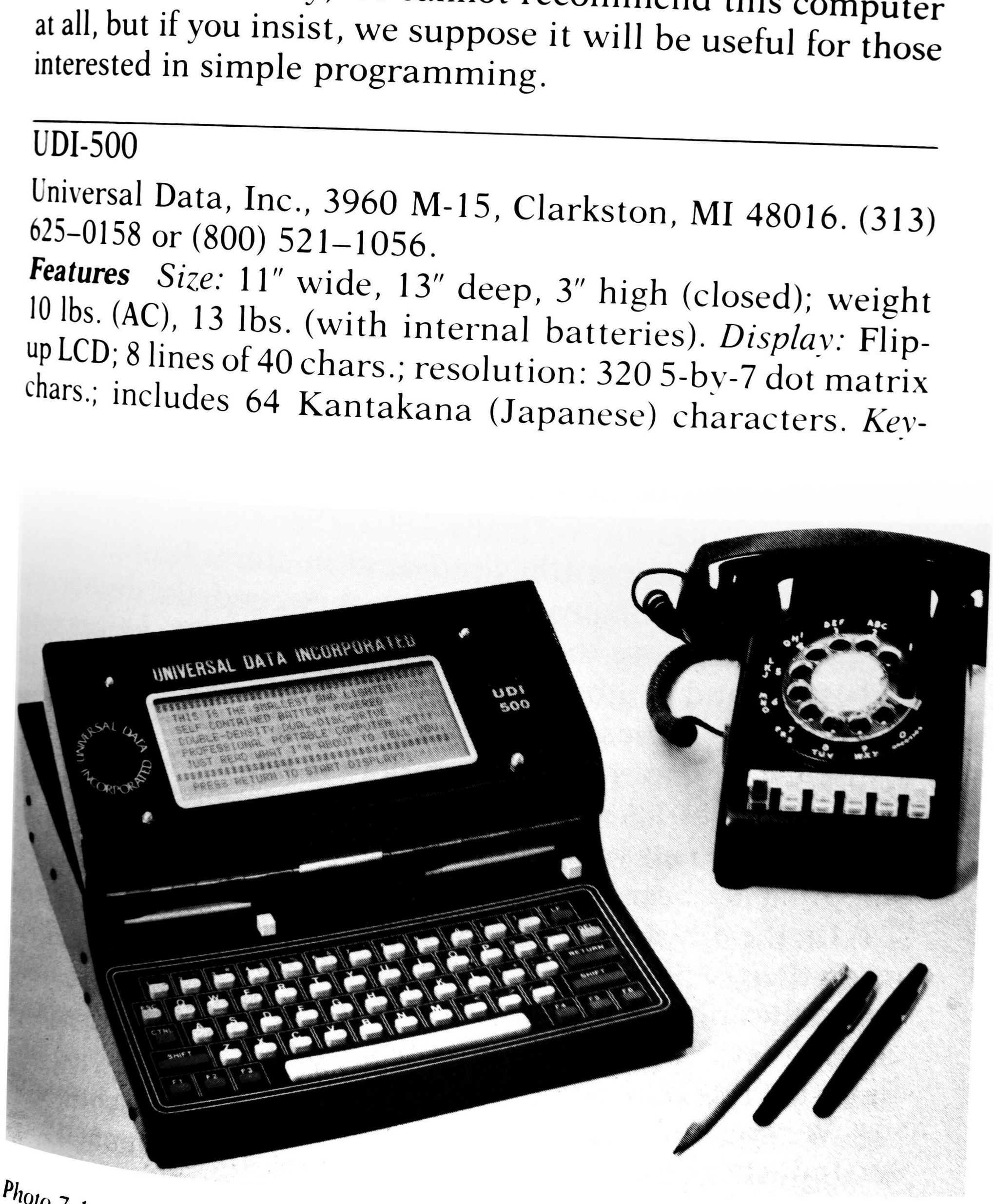


Photo 7-1. UDI-500.

board: 59 calculator-style keys including 6 function keys; no cursor control keys. *Processor:* choice of Z80 (CP/M), 8088 (MS-DOS, available second quarter 1984), or RCA 1802/1805 with hardware timer. *RAM:* 64K, expandable to 256K. *Mass storage:* two $3\frac{1}{2}$" Sony microfloppy disk drives, 322K capacity per drive. *Interfaces:* Centronics parallel port for Z80 card, RS-232 serial port and Centronics parallel ports for 1805 processor card. *Software:* still being determined; probably CP/M 2.2, VEDIT, CBASIC for Z80 configuration; possibly Perfect Software or WordStar. *Options:* 300 or 1200 baud modem card, single cards slot takes choice of 50 RCA add-in cards with the RCA 1805 processor; double-sided disk drives at 644K each. *List price:* under $4000.

Comments This machine is in the prototype stage and is intended for the industrial market. The maker sells hand-held industrial process computers to the auto and aircraft industries and the military. With its aluminum case, the system is intended for on-site use, and will be sold at first to major corporate accounts, although there has been some interest from the retail world.

There are two principal areas of interest in this computer. The first is the RCA chip, which makes the machine software compatible with the 1802/1805-based RCA line of industrial computers (they're found in stores keeping track of inventory, and on production lines). Second, the disk drives are higher capacity than larger $5\frac{1}{4}$" drives (322K versus typical 185K) and can be multiplied to 737K each, resulting in $1\frac{1}{2}$ megabytes of mass storage—a hefty amount for a briefcase computer, or any personal computer, for that matter. Add in the 256K of RAM and you have a computer suitable for field applications requiring a lot of data storage. Power consumption has been minimized so you get 12 hours per charge.

On the other hand, the chiclet-style keys on the keyboard mean there will be no real typing done on this machine. This is also the only computer we have ever seen that has no cursor control keys, a peculiar omission. These two items are fatal flaws for this as a general purpose computer.

We conclude that the UDI-500 is a specialty computer for industrial use, or for those needing a high-capacity remote terminal for component testing, but not for word processing or spreadsheet work.

Workslate

Convergent Technologies, 2500 Augustine Drive, Santa Clara, CA 95051. (408) 727–8830.

Features *Size:* 11″ wide, 8½″ deep, 1″ high; weight 3 lbs. *Display:* LCD; 16 lines of 46 chars. *Keyboard:* 64 keys, including separate numeric keypad and cursor control keys; calculator-style keys, not suitable for touch-typing. *Processor:* CMOS 6303. *RAM:* 16K, expandable internally to 32K. *ROM:* 64K. *Mass storage:* Built-in microcassette recorder, approximately 100K per 30-minute cassette. *Interfaces:* serial port; earphone jacks; AC adaptor plug. *Software:* Advanced spreadsheet in ROM, plus financial modeling, memo writing, and time management packages available on cassette. *Other features:* clock; internal battery; built-in, 300 baud, auto-dial/auto-answer modem; built-in microphone and speaker for dictating into cassette or using unit as a speakerphone. *List price:* $1195. *Options:* AC adaptor; microprinter (measures 8½″ by 6½″ by 1¾″) that uses 4½″ roll paper and prints in four colors, $250; cassette software for expense reporting, portfolio analysis, personal income tax records, and other financially-oriented applications, $19.95 to $49.95 each.

Comments Workslate does not have a typewriter-style keyboard, and thus fails to meet the minimum standards of functionality we set at the beginning of this book. We include this brief description of the unit because it will be widely promoted and many people will have questions about it.

Workslate represents what we feel is a tragic development in the personal computer industry: It is the first limited-purpose personal computer. Convergent Technologies has taken the marvelous flexibility of the computer and reduced it to a few specific functions which they, in their wisdom, have deemed the only functions necessary to the "executive on the go." In our opinion, this product is the result of a serious misjudgment of the computer marketplace. It has a barely-functional keyboard, because Convergent's designers apparently assume that executives are only capable of hunt-and-peck data entry. Its odd combination of a modem, spreadsheet software, and a microcassette that does double duty as both a data and voice recorder is a good example of trying to pinpoint specific needs and missing the mark. It is rather like having an electric drill that doubles as a martini

stirrer: there are, no doubt, some folks interested in such a configuration, but we don't know any of them.

By designing Workslate (and, we understand, subsequent products) for specific kinds of users, Convergent has the audacity to suppose that it knows exactly which applications you want and which ones you don't want. You have no choice here, and for our money, taking such a gorgeous general-purpose device as a computer and turning it into a limited-function device (and a bizarre collection of limited functions, too, we might add) is a crime. If you happen to want an oversized financial calculator that you can talk into while you jab its keys, so be it. If you want a portable computer, you should look elsewhere.

(As we go to press, Convergent Technologies has announced it will discontinue the Workslate due to poor sales.)

Chapter Eight

Using Your Portable

Once you've escaped the clutches of the computer salesman and have put the task of paying for your new computer behind you, it'll be time to set up the computer and use it. We have several suggestions that will help ensure a long, happy, and trouble-free relationship with your new baby.

Packing Materials

Whether or not you've had an in-store burn-in and demonstration session, your computer should be in its original box when you bring it home. If you were caught up in the moment of portable possession and insisted your computer dealer keep the packing material so you could swing your computer home by the handle, GO RIGHT BACK TO THAT STORE AND RETRIEVE THE BOX. As with stereos and other delicate electronic equipment, it's a must to hang onto the original packaging for as long as you can, in the unhappy event that you have to ship the unit somewhere for servicing. The manufacturer's box is designed to protect the computer; an old cardboard box stuffed with newspaper isn't. You should certainly keep the packaging for at least as long as the computer's warranty period. Even if service is available for the computer at a store around the corner, the store

itself may find it necessary to return the unit to the factory, and they'll need your box to do it right.

Inventory

After the computer, cables, manuals, warranty cards, and any other accessories are unboxed, take inventory. Check the items against your store receipt first, and then check the contents of each box against the components list that's usually located in the front of the owner's manual. There may well be a separate setup pamphlet that contains this list and some tips for setting up the computer. Naturally, being so methodical goes against our normal way of doing things, but try to imagine what it would be like to spend an hour clearing away an ideal spot for the computer, unpacking it, and setting it up only to discover that you're missing the power cord or some other vital part.

Providing a Work Area

Many of you may have bought a portable computer because you don't have room for a full-blown computer workstation. Nevertheless, you'll need at least a clear tabletop or desk to work at when you're getting comfortable with your new system. If you've bought a printer, external monitor, or other peripherals, you should have a permanent, convenient place for them where the cat won't sleep on them and your two-year-old won't mistake the monitor for the family television. At a minimum, the work area should:

Have Good Lighting The light should be even, and strong enough to light the area around the computer. It should come from above the computer rather than from behind or in front of it, to minimize glare on the display screen.

Have Good Electricity If your portable is the plug-in type, make sure your work area has a three-prong, grounded outlet of its own. Try to ensure that the outlet is on a circuit that isn't being shared with other large appliances, fluorescent lights, or heaters. An overloaded circuit may fail just when you've filled your computer's volatile memory with a year's worth of tax data. At the very least, a circuit shared with

other large devices will be subject to surges and "spikes," or variations in the current being delivered, that will cause your computer to do some strange and unpleasant things. Using an ungrounded circuit or an overloaded one is far more serious with a computer than it is with a Cuisinart, because your computer's electronics are far more delicate. If your electrical outlet isn't grounded (which is likely if it only has two slots instead of three), your local hardware store can give you some easy and inexpensive advice about how to remedy the situation. If you're worried about power surges (if, for example, you live in a place where the lights go dim whenever your electric heater goes on), it's best to invest fifty dollars or so in a line surge protector from your computer store.

Be Clean, Cool, and Dry While assuring a good, steady electrical source will protect the electronic parts of your computer, you still need to be kind to the mechanical parts, especially the disk drives. Your work area should be well-ventilated to ensure that a good supply of air circulates into and out of the computer. Many transportables have built-in fans that assist this process, but you'll want to make sure that the air circulating around the computer is free from dust and smoke particles. These particles, however tiny, can collect on the disk drive heads or the disks themselves and cause errors in the reading or writing of data. It should be obvious that the area should also be free from dampness or moisture. Don't set up next to a leaky window or the pressure relief valve on a radiator. Another destructive source of moisture might be termed the Pepsi Syndrome. Spilled beverages are an easily avoided disaster: just make a rule for yourself and others that no food or drink can be placed anywhere within falling or spilling distance of the computer or disks. As to ambient temperature, the computer shouldn't be operated in an area where the temperature is regularly above one hundred degrees. Components and circuits can be damaged, and floppy disks get positively limp under such conditions.

Be Convenient Ideally, the computer workplace should have a place for you to set your manuals while referring to them, a place for a notepad, and a convenient place to store your software and data disks. You can work out your own system. The ergonomists tell us that your monitor (this applies to

the transportables) should be placed slightly below eye level, about an arm's length from your face when you're sitting upright with your feet flat on the floor. As for the keyboard, different people have different preferences. You may like the idea of typing with your detachable keyboard or notebook computer in your lap; we find it uncomfortable. The experts say you should have your hands slightly below the level of your elbows when you're sitting upright for maximum long-term comfort.

Getting to Know You

Once your computer is set up in a comfortable place, you'll want to open the manual to page one and start reading. Reading instructions is something else we instinctively shy away from, but in this case reading just the basic sections of the manual can give you a good overview of the system and show you generally where certain kinds of information are located when you need to refer to them later. If you've gone through a demonstration and burn-in session at the computer store, the salesperson may well have suggested which parts of the manual you should read right away and which parts can be saved for reference. In most cases, the introductory information you should digest will require no more than an hour of your time and is well worth the agony of delaying your first physical encounter with the computer.

Moving About

It's true that your portable computer is bound to be more rugged than a desktop model, but it's still a delicate electronic device and should be treated accordingly. When you move the computer, make sure the case is properly closed and latched, and that the power cord, disks, and other accessories are stowed away in their proper places. When in motion, avoid setting the unit down abruptly or slamming it against doorways or walls. The possible damage may not be apparent until you set up again and find that your disk drives are making confetti out of your sales report data disk.

Don't move the computer at all when the disk drives are operating. The read/write heads are very sensitive to motion as well as dust and moisture. If you take the computer in a car, remember about excessive heat, and don't leave it locked in the trunk in Phoenix in August while you duck into a shopping mall for a few hours, unless you want to put your melted computer on display as high-tech art.

Security

Remember at all times that your computer is portable. You may have bought it because it's easy to move, but that also makes it easy to steal. Keep it locked up when you're away from it. Keep your eye on it when you're with it. If you have to leave the computer at a hotel, you might lock it to an immobile object with a cable bicycle lock, or stow it somewhere out of sight.

Airports and Airplanes

If you take your computer flying, there are several points to be aware of:

- Metal detectors use X-rays to examine carry-on luggage in airport terminals. X-rays aren't *supposed* to harm photographic film or magnetic media like recording tape or software disks. Just to be on the safe side, though, carry your software and data disks separately from the computer and have them hand-inspected. Or better yet, have the whole computer hand-inspected. Better safe than sorry.

- As baggage, your computer should be strictly carry-on material. Imagine the old American Tourister commercial with the gorilla tossing the suitcase around the cage, and consider what such treatment will do to your computer. If the computer is transportable, it should fit under the airline seat or in the airplane's special carry-on luggage compartment. If the computer is a briefcase or notebook portable, you should have it tucked inside your briefcase or under your arm.

- Computing in the air is, as far as current regulations go, a haphazard thing (very much up in the air). Attractive as it may seem to whip out your notebook computer and write your annual report while zooming over the Rockies at 35,000 feet, you shouldn't plan on using your flight time to compute. All portable computers, no matter how small, emit high-frequency electrical signals that can interfere with the aircraft's navigational equipment. This doesn't mean that the signals will interfere, necessarily; only that they could. In the absence of an FAA regulation specifically prohibiting the use of portable computers on airplanes, individual airlines are approaching the situation in different ways. Some airlines will allow airborne computing unless the pilot determines that it's interfering with his or her instruments. Some airlines specifically prohibit any computing. Some airlines allow computers on some flights and not on others. Some leave the problem up to the flight attendants.

The point is that you can't count on being able to compute in the air, so don't plan to complete an important project while in a holding pattern over La Guardia. If you want to know what the prevailing rule is on your particular flight, you can ask the flight attendant in advance. (Even if they give you the go-ahead, you may still find that the passenger next to you asks so many questions you can't work anyway.)

Modem-ing from Afar

If you're planning to telecommunicate from a travel location, plan in advance just how you'll make the connection. If you're calling an information utility, try to get the local Telenet, Tymnet, or Uninet number of your travel location in advance. Also, think about how you'll make the connection between your modem and the telephone lines. Many modems are direct-connect and require you to plug a telephone cord into a modular jack. This is fine and dandy if the location you're going to has modular jacks; otherwise you'll need an acoustic coupler for your modem. The acoustic couplers will work anywhere, but of course they're bulkier

and less portable than the simple telephone cord used in direct-connect. At any rate, it will pay to check out the phone facilities of your travel location before you go, so you'll be prepared.

Remote Display Monitors

If you are planning to use the television in a motel room as a monitor for your computer, it's wise to call ahead and verify that you can hook up to the antenna leads of the television set. Some hotels use televisions that have only the 75-ohm coaxial connector on the back, so you'll need a 75/300-ohm adapter to hook up to the set. Other hotels have their antenna or cable connections wired to a burglar alarm that goes off when the leads are disconnected. Imagine your embarrassment when the house detective kicks in your door as you're innocently trying to boot Perfect Writer on your Pied Piper. You can avoid such inconveniences by calling ahead and checking with the hotel's engineering or housekeeping supervisor to find out about the televisions.

Appendix A

Software Reviews

Review of Perfect Software

You may have responded to advertisements for products that seem too good to be true. The ads (for steak knives or vegetable slicers, often shown on late-night television) begin in a straightforward way, presenting a product that initially seems very much like competitive products. But then the "ands" begin. "And," the copy goes, "it does *this*. And," it continues, "it does this. And, it does this, too . . . and this, and this . . . and if that's not enough, it does this and this and this." Finally, you submit, psychologically bludgeoned by promises that the product not only does sixteen times as many things as competitive products, but that it costs less. So you respond to the ad, and you get the merchandise, and you see that, indeed, it has all of the features promised. But then you realize that the product is poorly-constructed, so that those extra features don't hold up very long. The steak knives are indeed sharp, but the imitation bone handles fall off in the dishwasher. One by one, those extras that tempted you to buy the product cease functioning or else don't prove to be as worthwhile as you thought, and you end up longing for a plain but sturdy brand that has been selling for years.

Unfortunately, such is our experience with Perfect Soft-

ware's line of products. The promising name of Perfect and the ads describing how feature-packed, competitively priced, and easy-to-use these packages are, is incongruent with consumer response; none of these products has ever graced a best-sellers chart. When we ran the programs one by one, we understood why.

PERFECT WRITER

Perfect Writer is, first of all, not perfect. It has a couple of interesting features, and a couple of not so interesting features.

It's a powerful, full-featured word processor and is the most widely bundled word processor in the personal computer market. (The fact that the entire Perfect Software line—four programs—can be bundled with a computer at a cost of only $40 to the manufacturer may have something to do with it. At least, that's what we hear. WordStar, by contrast, costs $80 all by itself.) But it's hardly "the revolution in software," as its ads proclaim.

One of Perfect Writer's principal features is that its files are compatible with Perfect Speller, Perfect Filer, and Perfect Calc. But most word processors are compatible with spellers, and most calc programs can produce text files usable by word processors. Further, the commands used in all of the Perfect programs are the same, so you don't have to learn new cursor control codes with each program. That point is good. However, Perfect Writer's control codes are difficult, and there are a few disturbing lapses, such as the lowercase control characters that are unique (for no apparent reason) to Perfect Calc.

Perfect Writer's best idea is "buffers," which divide memory into seven areas in which you can place individual documents and work on them all at the same time: switch back and forth between them, split the screen in half and look at two simultaneously, and move text back and forth among them—that's where Perfect Writer shines. Most word processors, including WordStar, can trade text between files, but PW's system is faster and more convenient. PW is also the only 8-bit CP/M word processor we know that offers a

split screen, a very nice feature indeed. You can keep notes in the top half and write the article in the bottom half.

You can order Perfect Writer to save your text after every paragraph or so, a safety feature best appreciated by someone who has just lost ten pages of text because the cord got kicked out of the wall socket.

Perfect Writer also includes many features you usually have to buy in separate programs: footnotes, indexing, table of contents, and cross-referencing, as well as a sort of mini-mailmerge capability. While these features aren't superior to some programs on the market, their inclusion in Perfect Writer saves time and money.

Finally, PW's printing and formatting options are extensive: proportional characters (spacing) is supported (not so in WordStar); up to three lines of headers and footers can be used (versus WordStar's one each); elaborate formatting permits block indents, hanging indents, nested block indents, double indents, numbered indents, flush right text, and generates indexes and footnotes.

All of these are features of a good, sophisticated word processor. Other word processors offer many or all of these features, with the exception of the buffers, so Perfect Writer's claim to being the most sophisticated word processing system is an exaggeration.

Let's look at the imperfections of Perfect Writer.

The main problem with the program is the elaborate, involved, and unintuitive command codes. PW claims to be simple to use, primarily due to its mnemonic control sequences. In fact, Perfect Writer, with its one hundred codes, is worse by far than WordStar and its two hundred commands.

Perfect Writer is a jungle of control and escape sequences, many of them too similar to one another. There are single, double, and single-with-two-character control codes, plus escape sequences, and sometimes control codes and escape sequences combined. There are even escape sequences which require shift characters—a new low in program design.

A few examples: "CTRL-X,B" means one thing (switch buffers) and "CTRL-X,CTRL-B" means something else (get buffer director). "CTRL-B" means back a character, "ESC-B" means back a word. "A" is for back, but "CTRL-A" means

go to the beginning of the line, "ESC-A" means the beginning of the sentence (what's the "A" supposed to stand for?). "ESC-<" (that's a shift character) means the beginning of the document.

Then there's "CTRL-S" for *Search*, and "CTRL-R" for *Reverse Search*, but "ESC-R" for *Search and Replace* (not *Reverse Search and Replace*, just plain vanilla *Search and Replace*; "ESC-S" is already busy as the *Centering* command). And "ESC-CTRL-R" is for search and replace but query each replacement first. Are you really going to be able to remember which of these is which, even after using them for awhile?

A mnemonic system where codes use letters that stand for what they do can only succeed if the number of codes is severely limited. There are only so many letters, and they tend to get in one another's way. And strict mnemonics runs into the illogical layout of the QWERTY keyboard: the "F" for *Forward* and "B" for *Backward* are at random locations on the keyboard. And it's hard to remember what stands for what: is "S" for *Search* or for *Sentence?* Does "W" stand for *Word* or "B" for *Beginning* or *Buffer?*

Perfect Writer actually invents words in an attempt to maintain its claim to a mnemonic system: "Yankback," for example, is a form of block movement. So instead of memorizing the control sequence, you memorize a whole new vocabulary—hardly an improvement.

Not only are Perfect Writer's codes confusing, they are cumbersome; try these jumbos: "ESC-CTRL-O," to close an insert, "ESC-CTRL-K" to delete a line, or "ESC-SHIFT->" to move the cursor to the beginning of the document. If you like those, try the codes that are both cumbersome and confusing at the same time: "CTRL-X-CTRL-S" means save the file to the disk; "CTRL-X,S" means run the spelling checker program. If you erased the spelling checker program from the disk (because you bought a better one), the program stops dead and you lose your text.

Perfect Writer offers an elaborate formatting language for highly formatted text, but it's awash with braces, brackets, symbols, and commands like *Prefacesection* and *Subheading*. When using this formatter, what you see is not remotely what you get. However, something like a doctoral thesis that is heavily footnoted and that uses multiple indents might benefit from Perfect Writer's formatting power. (Al-

though the justification for some of the commands is difficult to see: *@blankspace (3 lines)* causes the printer to skip three lines. To what end? Why not just hit the "return" key three times?)

Our final objection is that Perfect Writer takes its time getting characters on the screen. On the Kaypro, for example, characters appear in bursts of two to five at a time. The Actrix we tested was worse: with a fast typist, the screen just went dead and waited for a pause. The display could get an entire line behind! This throws you off your typing, and would be considered by touch-typists a nearly unforgivable flaw (and is the reason the Actrix is rated suitable only for casual word processing.) It is, in an event, the kind of shortcoming one is accustomed to seeing only in primitive word processors for home computers.

Documentation We should mention Perfect Writer's documentation, because decent documentation is rare in the computer world. The manuals for the entire Perfect Software line are not bad at all (they can't help it if they're explaining cumbersome control codes).

The Perfect Writer manual has a table of contents and a thorough index. (You think those are odd features to point out? Almost no computer manuals have indexes, and few even have tables of contents!) It's written clearly, has plenty of examples, and is written in that language so seldom encountered in the computer world: English.

There's also a glossary and an appendix telling you how to set up your function keys to handle those overblown formatting commands. And best of all, there's a command summary card for each program, listing all the commands in one spot. The only major flaw is that the commands are not summarized anywhere in the manual itself—so don't lose that command summary card.

Summary Perfect Writer's good points include:

- multiple buffers, with swapping between buffers;
- periodic auto save;
- built-in footnoting, indexing and table of contents program;
- split screen (our vote as Best Idea);
- documentation.

Perfect Writer's bad points include:

- confusing array of control and escape codes which are hard to learn and hard to use;
- slow screen response, regardless of computer;
- odd, cumbersome document design program;
- incredibly overblown advertising that takes credit for ideas (like virtual memory) that aren't new at all, and claims that Perfect Software is easier to learn than WordStar when the reverse is true.

One of Perfect Software's advertising brochures quotes the company's vice president as saying, "We founded our company on the premise that software could be perfect." It's not. The brochure then quotes the president as saying, "We got it right the first time." They didn't. They credit themselves with starting "A Revolution in Software" (title of their brochure). They haven't. Good—yes; perfect—no.

For casual word processing, we rate this program poor and inferior to WordStar because of the large number of control codes and escape sequences that need to be learned. For heavy word processing, we also rate this program poor, because while the control codes will become familiar with time, and while the buffers are very handy, the slow display to screen is an unacceptable flaw.

PERFECT SPELLER

When Perfect Writer is bundled, Perfect Speller is usually included too. This is an adequate spelling program with a large vocabulary (50,000 words) and in-context display. Unfortunately, it gets those 50,000 words in a small amount of disk space by the root-and-suffix method: the words are reduced to their linguistic roots, and matched up with a separate table of all possible prefixes and suffixes. Any root combined with any plural or suffix is "legal." Thus, "in-searchment" is considered legal because it consists of the root "search," the prefix "in" and the suffix "ment."

But most people use spellers to find garbled characters in the middle of long words: an "o" dropped from "tion" or

a missing letter in a double consonant. One rarely creates nonsense words from roots and suffixes, except to display the spelling checker's ignorance. The main place the root-and-suffix method fails is in plurals: anything with an "s" on the end is a legal plural.

Other spellers, such as The Word Plus or Spellguard, are more powerful and more accurate, or faster. The main virtue of Perfect Speller is not that it's superior, but rather that it's free.

PERFECT CALC

This is Perfect's spreadsheet program, which the manufacturer claims is superior to industry standards like VisiCalc and Multiplan. At first glance, the claims seem true. For sheer features, Perfect Calc has all the other spreadsheets beat hands down: seven separate buffers, linked spreadsheets, split screens with two different spreadsheets displayed. But best of all, there's virtual memory to solve the nagging problem of limited RAM.

The trouble with spreadsheet programs is that they operate entirely in RAM. On 64K computers the program itself occupies so much RAM (about 40K) that there's not much memory left over for large spreadsheets. 20K of RAM is not nearly enough to make a worksheet that fills the 255 rows by 60 columns most spreadsheets allow. So you're frustrated by the luxury of having a theoretical capability of creating monster spreadsheets, but a practical capability of creating only modest ones.

Other spreadsheet programs solve this problem by allowing you to link up multiple spreadsheets, so you can transfer data from one to another. This is fine, except that you're still only working on one spreadsheet at a time.

Perfect Calc uses a technique called virtual memory, which, in effect, cures the limited RAM problem by swapping portions of the program and data back and forth between a disk file and RAM as they are needed. For example, if you're working on the top part of a large spreadsheet and then issue a command to look at the bottom part, the top portion will be stored on disk and the bottom part retrieved from disk. This way, you effectively re-use your RAM by constantly ex-

changing the data and program functions. The result is that your spreadsheet can, in theory, be as large as your disk capacity (the practical limit, however, seems to be about 64K).

This disk/RAM combination of Perfect Calc is a decided asset over other spreadsheet programs in some respects, but you pay a price for it: speed. With other programs, calculations take place at the speed of electronic processing, which is pretty fast. But with Perfect Calc, a whole-sheet calculation can take quite a long time because you have to wait for the entire sheet to be swapped on and off disk.

In addition, Perfect Calc itself is not loaded entirely into RAM, but operates with a series of overlay files on disk. The most common cursor movement commands are in memory at all times, but less-used commands and many calculation formulas are kept on disk until needed. Thus, the ordinary creation of the spreadsheet can take annoyingly long. (Other calcs, SuperCalc among them, also suffer from this drawback.)

Perfect Calc is one of the only calc programs that allow you to edit two different spreadsheet files on the screen at once. You can split the screen either horizontally or vertically and look at two completely different spreadsheets. And there's more: you can also have up to seven different worksheets stored in RAM at once, each in its individual buffer. And you can swap between these buffers to display the different files on screen. These are indeed nice features, but they're a little too good to be true. Running Perfect Calc on some computers, we found that switching between two worksheets on a split screen had peculiar results. Sometimes, upon moving from one side of the split to the other, the cursor erased the data wherever it went. This occurred without our having given any commands other than the one to change sides of the screen. Naturally, this little annoyance will be a big pain if you've spent hours creating the spreadsheet and haven't saved it on disk yet.

Another of Perfect Calc's claims to fame is its functions library, which is a file that contains common calculation commands. These commands amount to prewritten statistical formulas for things like net present value, and you can add formulas you've written yourself to the library as you use Perfect Calc, so that you can access them easily when

you need them instead of having to re-write them each time. This is a great idea, and performed as advertised.

Separate spreadsheets can be linked together in Perfect Calc so that changing numbers in one causes the others on disk to be updated automatically. This means you can break down your spreadsheet into separate logical components, and share relevant data among them. This capability appeared to function correctly.

Formatting is conventional, with centering, title lock, protected entries, and graphic display mode provided. Formulas and built-in functions are the selection usual to calc programs.

Perfect Calc stores its information in standard ASCII (text) coding, which means you can read Perfect Calc files using an ordinary word processor. Most other calc programs store their information in packed binary code, which is faster for calculation, faster for loading files, and takes up less disk space. However, you can't read packed binary, so other calc programs include a special command converting a spreadsheet into a disk file that can be read by your word processor. Perfect Calc saves this step. In addition, if there is a disk failure, it is possible to recover the spreadsheet from RAM if it is in ASCII, whereas you can't really recover a packed binary file from RAM.

Finally, Perfect Calc claims superior ease of use. We will say that its commands are mostly mnemonic (that is, deleting is done with the "D" key, printing with the "P" key, etc.). However, as with Perfect Writer, many of these commands are mnemonic only if you ignore the invented words, like "Yankback." In addition, many commands require double control sequences ("CTRL-X," "CTRL-Y") which is twice the number most other spreadsheets need for similar functions. In addition, Perfect Calc adds its own special bit of user harassment: it alone requires some control codes to be used with lowercase letters, and others with capitals. The reason is unknown, since none of the related programs has this requirement. We point out here that it's nice for a product to be easy to learn (and this one is), but in the long run it's vastly more important for a product to be easy to use (and we've definitely seen easier).

One genuinely nice extra offered by Perfect Calc that we'd like to see widely imitated is its inclusion of several

useful prewritten template programs that come on the program disk (see sample). By loading prewritten files—like the family budget program, individual net worth, income tax analysis, cash flow assessment, payroll, and accounts receivable—into a blank spreadsheet, the program automatically creates preformatted spreadsheets for these applications so that new users can be spreadsheeting as soon as they learn the program's basic commands. All the calculation formulas are built-in to these application files. The only thing they lack is the data you enter. Of course, the manual warns that the calculation formulas may not correspond to current state laws, and advises you against using the sheets to perform important accounting or tax work without consulting a tax adviser or accountant. In addition, we have heard it claimed the formulas used in some of the template programs are erroneous. We were unable to confirm this, but fair warning.

In the final analysis, Perfect Calc is a wonderful idea marginally executed. We would like to say that this program performs up to its laudable billing, but we can't. We would like to say that Perfect Software will soon have all the bugs ironed out, but after two years in business with no improvement in quality of its products, we can't. Using Perfect Calc versus an industry standard like Multiplan or VisiCalc is like using a feature-packed homemade radio instead of going out and buying a Sony. You get more features, all right, but you never know when the thing will conk out on you. With software, we place error-handling and reliability at the top of the needs list, and Perfect Calc doesn't satisfy us in those respects.

PERFECT FILER

Perfect Filer is a simple list processor with many convenient features, but calling it a Filer, file management program, or "powerful" records management system is the kind of exaggeration we've come to expect from Perfect Software.

As a list processor, Perfect Filer is good for maintaining lists: addresses, club members, clients, or a mailing list for sending out personalized form letters (in conjunction with Perfect Writer). Small conveniences aid in the creation of the list and input of data: the preformatted templates for name

Real Estate Investment Analysis
Income Property
($000)

	Year 1	Year 2	Year 3	Year 4	Year 5
Assumptions:					
Net Operating Income	12.0	13.8	15.9	18.3	21.0
Mortgage Inputs	1.0	150.0	-	30.0	16.0
Depreciation Inputs	2.0	120.0	20.0	15.0	-
Purchase Price	200.0	40.0	-	-	-
Tax Shelter Impact					
Net Operating Income	12.0	13.8	15.9	18.3	21.0
Depreciation Allowance	12.5	11.7	10.8	10.0	9.2
Interest Expense	24.0	23.9	23.9	23.8	23.8
Taxable Income	-24.5	-21.8	-18.9	-15.6	-12.0
Income Tax (Shelter)	-9.8	-8.7	-7.5	-6.2	-4.8
After Tax Income (Loss)	-14.7	-13.1	-11.3	-9.4	-7.2
Cashflow Impact					
Net Operating Income	12.0	13.8	15.9	18.3	21.0
Mortgage Payments	24.2	24.2	24.2	24.2	24.2
Income Tax (Shelter)	-9.8	-8.7	-7.5	-6.2	-4.8
Cashflow (Outflow)	-2.4	-1.7	-0.8	0.3	1.6
Cashflow Rate	-4.8%	-3.4%	-1.6%	0.6%	3.1%
Equity Impact					
Net Operating Income	12.0	13.8	15.9	18.3	21.0
Interest Expense	24.0	23.9	23.9	23.8	23.8
Income Tax (Shelter)	-9.8	-8.7	-7.5	-6.2	-4.8
Equity Income	-2.2	-1.4	-0.5	0.6	2.0
Equity Rate	-4.4%	-2.8%	-1.0%	1.3%	4.0%

Example of pre-written template included with Perfect Calc.

and address, date, time, dollar figures, and social security number. You just copy the premade item into your layout with a keystroke. Another command during data entry inserts the date in the field, increments and inserts the next

number in a series (say, membership number), or finds a matching record.

You can produce a sorted list or select out certain groups from the list (all members with renewal date prior to last January, for example). You can combine this with Perfect Writer and produce form letters. Perfect Filer is therefore an easy-to-use list manager.

Perfect Filer is not a full-fledged data base management system like dBase II, of course, but it cannot be called a file management system either, because it lacks any mathematical abilities. Perfect Filer cannot sum fields within a record, nor records in the data base. That means you can keep and sort lists, but you can't do anything involving sums and extensions, which eliminates invoices, check writing, inventory, and sales reports. Since all of these can be easily produced by competing file management programs, Perfect Filer is clearly no match for programs like Personal Pearl.

Review of WordStar

It's expensive, complex, and comes with an inadequate user's manual. Yet WordStar is the best selling word processing program on the microcomputer market. In fact it may be the most widely distributed program of all, beating even the legendary VisiCalc.

While it is one of the most expensive word processors, WordStar has also been widely distributed illegally and was the first word processor to be bundled with a computer: 150,000 Osborne owners received the program free. Thus WordStar's market has grown, despite its price, and that growth makes WordStar desirable even to those who must pay for it.

It is a tribute to WordStar's power and flexibility that it is still a top-rated word processing program after all these years. Like that other spry oldster, the Apple II, WordStar survives by being infinitely malleable, extensible, and adaptable to your every need. Though every new word processing program compares itself to WordStar, somehow WordStar still sits on the throne—fatter and slower than before, perhaps, but still powerful. Let's see what makes WordStar so widely appealing, and then we'll look at some of its shortcomings.

What You See Is What You Get

WordStar belongs to the small fraternity of word processors characterized by the remark "What you see is what you get." In other words, what you see on the screen as you work is roughly what the final result will look like on paper.

Many word processors are two-part programs consisting of an editor and a print formatter. You write and edit with the editor, then use the print formatter to decide on things like margins and indentations.

In a standard letter, you can just print what is on the screen without bothering to format, and what you see on the screen will be dumped to the printer as is. But if you want to get fancy, you must insert special codes in your document, then run the formatter to convert these codes into margins, justification, boldfacing, special page breaks, and indented paragraphs. What you see is not what you get: formatting is done on the way to the printer. True, you can "format to screen" to "preview" the text, but that's an extra step. The advantages of an editor/formatter program are: it takes up less disk and RAM space; it is usually cheaper; some of them are simpler to use and others are more powerful in certain kinds of formatting commands.

WordStar, on the other hand, does everything "live." You make print formatting decisions as you write. Want to change a margin? Enter a few control commands and the margin changes in front of your eyes. Right justify? The text appears justified on the screen, just as it will on paper. Need to start a new page? WordStar shows the page break right on the screen, something few word processors do. Want to indent a paragraph? WordStar shows it indented, whereas with a formatter you would enter a code, and the indenting would be taken care of during printout.

The most advanced formatting word processors, on the other hand, pick up admirers for their special formatting in ways not easily done with WordStar. For example, many formatters will do proportional characters (proportional spacing), whereas WordStar can only do this if you buy a $200 add-on program, and sacrifice "what you see is what you get" (because few personal computers can display proportional characters on the screen).

Here is where the WordStar enthusiasts part company

with the editor formatter crowd. People like WordStar because they like the "live" quality: they can see the results immediately, as they write. Other people enjoy the extra formatting power or simplicity of other programs. In addition, formatter programs can be better dollar buys when they include special built-in features that cost extra with WordStar: footnote or indexing subprograms, built-in spelling checkers, or mailmerge.

WordStar is very powerful. Here's a laundry list: boldface, underlines, strikeouts, superscripts and subscripts, strikeovers, pause the printer, change ribbon color automatically, center, select various printer pitches and line heights, set and change side margins, top and bottom margins, page length, page width, line spacing up to nine, and tabs. You can reformat a paragraph to conform to the margins, and WordStar will suggest hyphen locations for you. You can mark off blocks in the text and move them, copy them, delete them, write them out to a separate file, or move a separate disk file into the on-screen document. There are twenty-eight ways to move the cursor, six ways to move the screen, eight ways to delete, and ten invisible markers to keep track of it all. You can find text and replace it with other text—with half a dozen options along the way. While in the middle of editing, you can stop to look at the disk directory and manipulate other files: rename, delete, print, copy, or change logged disk drives. You can run another program without leaving WordStar. You can put in dot commands to override your on-screen formatting, select or omit page numbering, force a new page to start, prevent a page break from splitting a heading from its paragraph, select exactly how much the carriage return should roll when doing a superscript, or enter a nonprinting comment line.

Just in case you're overwhelmed by it all, WordStar provides lengthy help menus reminding you of your dozens of options at each step. Or if you don't want or don't need them you can turn off the help menus, and also the page break displays, the control code displays, the hyphen help, the right justification, the microjustified printing, the word wrap, and the file directory. One thing WordStar never lacks is options. What you see is what you get, and if you don't see it, just ask: WordStar will come up with something. If it's not part of the program, that's okay too because WordStar is easy to

"patch"; you can change the program code to accommodate new features or access fancy functions on your printer.

As you can see, WordStar isn't the Cadillac of word processing programs: it's one of those Winnebagos you see on the highway, towing a VW, with the inflatable raft and lawn chairs on the roof and the trail bike on the back—something for everybody.

With all its commands, WordStar has a reputation for being the hardest word processing program to learn. This is partly due to the original WordStar manual, which was horrendous and has since been replaced. But most of it is due to the mistaken idea that you have to learn all 200 of WordStar's commands before you can use it.

This is simply not true. WordStar is not a 747, where you must learn every single dial by heart before you can take 'er up. Most of WordStar's functions are simply extensions, extra fancy ways of doing ordinary things. To learn WordStar, you need only learn a few commands, most of them easily remembered. *Cursor* movement (using the arrow keys), *Open* a document, *Close* a document, *Print* a document, *Delete* a character, *Delete* a word, *Reformat* a paragraph. That's it. Learn those and you can use WordStar for a month without having to learn another thing. Later, when you get the hang of it, you can pick through WordStar's remaining inventory for just the commands you need.

Intimidating or not, people buy WordStar because it also has a reputation as the most satisfying powerful word processor, once you've learned it. In fact, WordStar compares in power to a full-fledged dedicated word processing computer costing $10,000 or more.

The Other Side of the Coin

This brings us to WordStar's major flaw: it is slow. Not in putting characters on the screen—that unforgivable flaw of Perfect Writer cannot be laid at WordStar's door—but rather in obeying commands.

WordStar is so large, so all-inclusive, that it takes up some 85K of disk space. This is obviously too large a program to fit into RAM, so only a portion, 50K, is put into memory at once. When you issue a command involving instructions not in RAM at the moment, WordStar goes to disk to get them. This involves a slight delay, which some people find

intolerable. Edit/format programs are usually loaded entirely into RAM at once, so they operate faster. Documents fill up the remaining 30K or so of RAM in edit/format programs.

Further, since WordStar has only left about 8K in RAM for your text, it puts the excess of that, too, on disk. This is called "virtual memory," an idea swiped from old IBM mainframes. In other words, WordStar treats the disk as an extension of your RAM, which means in theory you can have documents as large as your disks (in practice, you can't do practical editing with files larger than about 30K). Again, there are slowdowns involved in repeatedly going to the disk.

The latest version, WordStar 3.3, has again added new features and increased its size, and has slowed down even more, especially when scrolling through a document. Sometimes WordStar 3.3 threatens to actually pause while putting characters up on the screen!

WordStar on the IBM PC and other 16-bit computers with larger RAMs should be faster because there's more RAM to work with. But WordStar was just run through a "translator" and converted to IBM code, the result being that it grew to over 120K in size. In keeping with some sort of programmer's Peter Principle, it had grown to exceed the RAM available for its use! The result was a WordStar not much faster on the IBM PC than on the Osborne 1.

In sum, WordStar is powerful and easy to use, and shows you what you're doing while you're doing it. It's a well-proven program, thoroughly debugged, and well-supported by the maker and by the market. With so many WordStar owners out there, magazine articles about adapting it to special situations are common. It can also be somewhat slow in operation, and ties up one of your disk drives at all times. And it's very expensive if you have to buy it, but very cheap if you get it free with your computer. It shows no signs of yielding its place as one of the top word processing programs, although upstarts are appearing everywhere to challenge it with greater power and lower prices.

Appendix B

Suggested Reading

Books

General Computer Knowledge

- *Introduction To Computers, Volumes 0 and 1,* by Adam Osborne; Osborne/McGraw-Hill
- *Electronic Life,* by Michael Crichton; Alfred Knopf
- *Your First Computer,* by Rodnay Zaks; Sybex
- *Computers for Everybody,* by Jerry Willis and Merl Miller; Dilithium Press

Operating Systems

- *The Osborne CP/M User Guide,* by Thom Hogan; Osborne/McGraw-Hill
- *How To Get Started With MS-DOS,* by Carl Townsend; Dilithium Press

Word Processing

- *The Word Processing Buyer's Guide,* by Arthur Naiman; McGraw-Hill
- *Introduction To WordStar,* by Arthur Naiman; Sybex

Spreadsheets

- *Doing Business With SuperCalc,* by Stanley R. Trost; Sybex
- *The Power Of: MultiPlan;* Management Information Source

Data Base Management

- *CP/M Database Management Systems,* by Carl Townsend; Dilithium Press

Programming

- *Radio Shack BASIC, Level II,* by David A. Lien; Tandy Corporation
- *Fifty BASIC Exercises,* by J. P. Lamoitier; Sybex
- *Introduction to PASCAL,* by Rodnay Zaks; Sybex
- *Elementary BASIC,* by Henry Ledgard and Andrew Singer; Random House

Telecommunications

- *The Complete Handbook of Personal Computer Communications,* by Alfred Glossbrenner; St. Martin's

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Periodicals

- *Business Computer Systems*—An applications-oriented magazine that covers uses of computers in the business environment, written at a level almost everyone can understand.
- *Byte*—A technically oriented magazine with extremely thorough product reviews. Not for the beginner.
- *Creative Computing*—A catchall for intermediate to advanced users, containing program listings, reviews, and features about computer applications.

- *Infoworld*—The only consumer-oriented weekly publication. A must for people who want to keep up with the latest computer developments. Offers industry and new product news, several hardware and software reviews per issue, and features about industry trends.
- *Interface Age*—A general computer magazine for the business user. Offers applications stories, industry news, reports on overall trends in computing, and reviews.
- *PC*—Devoted only to IBM Personal Computers and PC compatibles. An applications-oriented magazine that is competing with *Byte* to see who can publish the thickest magazine in the world. *PC* is winning, with current issues running somewhere around six hundred pages. Offers applications stories, user tips, and product reviews.
- *PC World*—An applications-oriented magazine for users of IBM PCs and PC-compatible computers. Features reviews, product news, applications stories, product reviews, interviews, user tips, and program listings.
- *Personal Computing*—An applications-oriented magazine that boasts the largest circulation in the industry. Features applications articles, interviews, hardware and software reviews, buyers' guides, and extensive product listings.
- *Personal Software*—Devoted to reports about applications areas and detailed software reviews that include color screen photos. Reviews are experience-oriented rather than feature-oriented.
- *Popular Computing*—A mainstream version of Byte, with product reviews, industry news, user tips, applications articles, buyers' guides, and program listings.
- *Portable Computer*—The only newstand monthly devoted exclusively to portable computers. Includes product reviews, productivity and travel information, and interviews with industry notables.

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Charles Rubin is an Associate Editor of **Personal Computing** and **Personal Software** magazines. **Michael McCarthy** is a senior technical writer for Dysan Corporation.

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